Engineering Standard

D-SPE-STD-001
Water Supply Networks
(Supplement to WSA03-2011)

(This document must be read in conjunction with the WSAA Water Supply Code of Australia: WSA03-2011 Version 3.3)

Document number: SPE-00395

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Ver No.	Description	Document Owner		Document Approver		
		Position	Approval	Position	Approval	Approval Date
4	Amended Version	Principal Engineering Standards and Assurance	Refer to supporting Info in REX	General Manager Engineering	Refer to supporting Info in REX	10/03/2026

Preface

This document was originally published on 13 May 2011 by The Queensland Bulk Water Transport Authority (trading as Linkwater) as “Supplementary Manual to WSAA Water Supply Code of Australia WSA 03-2001 Third Edition Version 3.2 (Revision 0)”. Subsequent revisions of that Manual were published by The Queensland Bulk Water Authority (trading as Seqwater) as follows: Revision 1 - 07/01/2013, Revision 2 – 12/09/2013, Revision 3 – 12/11/2013, Revision 4 – 17/6/2014, Revision 5 – 27/10/2014, Revision 5a – 10/12/15.

A new edition of the document was published on 18 June 2018 as Seqwater Engineering Standard D-SPE-STD-001 “Seqwater Supplementary Manual to Water Supply Association of Australia – Water Supply Code of Australia” (Rev 1) and included in Seqwater’s Controlled Document Management System as Document Number SPE-00395.

From Revision 4 of the current edition onwards the main title has been updated to “Engineering Standard D-SPE-STD-001 Water Supply Networks (Supplement to WSA03-2011)” to better reflect the subject matter of the document while also referencing the industry code that underpins this Standard.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Table of Contents

Introduction **8**

0.1 Purpose 8
0.2 Scope 8
0.3 Definitions and abbreviations 9
0.4 Operation 9
0.5 Responsibilities 10
0.6 Reference documents 10
0.7 Disclaimer 12
0.8 Changes from previous version 12
0.9 Verification 13

Part 1: Planning and design **14**

1. General **14**

1.1 Scope 14
1.2 Planning and Design 14
1.2.2 Scope and requirements 14
1.2.5 Detailed design 14
1.2.5.1 Designer's needs and responsibilities 14
1.2.5.2 Requirements to be addressed 14
1.2.5.3 Design outputs 15
1.2.6 Design life 15
1.2.7 Instrumentation and control systems 16
1.2.8 Electrical equipment and systems 16
1.2.9 Mechanical equipment 16

2 System planning **17**

2.3 Demands 17
2.3.1 General 17
2.5 System hydraulics 17
2.5.3 Operating pressures 17
2.5.3.2 Maximum allowable service pressure 17
2.6 Water quality 17
2.6.1 General 17
2.7 Separation of drinking and non-drinking water supply systems 17
2.7.2 Temporary cross links 17

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

2.8 Pumping stations 17
2.8.2 Design Factors 17
2.8.2.2 Site related factors 17
2.8.2.3 Service related factors 18
2.10 Trenchless techniques for pipelaying 18
2.13 Water quality facilities 18

3 Hydraulic design 19
3.1 Sizing 19
3.1.3 Empirical sizing of reticulation mains 19
3.8 Pipeline components minimum pressure class 19

4 Products and materials 19
4.3 Ductile Iron Pipeline Systems 19
4.3.7 Coatings 19
4.3.8 Soil Assessment for Ductile Iron Pipe Without Loose Polyethylene Sleeving 19
4.3.8.1 Soil Parameters and Conditions to be Assessed 19
4.3.8.2 Acceptable Test Methods 20
4.3.8.3 Testing Frequency and Location 20
4.3.8.4 Acceptable Testing Organisation 20
4.3.8.5 Supplier Acceptance 20
4.3.8.6 Soil Condition Criteria by Coating Type 21
4.3.8.7 Documentation 21
4.5 PE Pipeline Systems 21
4.5.3 Limitation on Use of PE Pipeline Systems 21
4.6 Steel pipeline systems 23
4.6.3 Joints 23
4.7 GRP pipeline systems 23
4.8 Protection against degradation 23
4.8.5 Cathodic protection 23
4.8.8 Bolted connections 23

5 General design 24
5.1 General requirements 24
5.1.1 Design tolerances 24
5.1.4 Environmental considerations 24
5.3 Water main access 24
5.4 Location of water mains 24
5.4.2 Water Mains in Road Reserves 24

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

5.4.2.1 General 24
5.4.2.2 Location in footway 25
5.4.3 Location in other than dedicated public road reserves 25
5.4.4 Water mains in easements 25
5.4.9 Crossings 26
5.4.9.1 General 26
5.4.9.2 Requirements for encased pipe installations 26
5.4.10 Railway reserves 26
5.4.11 Crossings of creeks or drainage reserves 26
5.4.12 Overhead power lines and transmission towers 26
5.4.13 Water mains in conjunction with landscaping and/or other development 26
5.4.15 Location markers 27
5.4.16 Marking tape 27
5.4.16.2 Mains 27
5.6 Shared trenching 27
5.9 Connection of new mains to existing mains 27
5.11 Property services 27
5.12 Obstructions and clearances 28
5.12.5.1 General 28
5.12.6 Deviation of water mains 29
5.12.6.1 General 29
5.12.6.2 Horizontal deviation of water mains 29
5.12.6.3 Vertical deviation of water mains 29
5.12.6.4 Curving of pipes to avoid obstructions 30
7. Structural design 30
7.4 External forces 30
7.4.2 Pipe cover 30
7.5 Geotechnical considerations 30
7.5.1 General 30
7.6 Concrete encasement 31
7.6.2 Requirements 31
7.6.3 Encased Steel Pipelines 31
7.6.3.2 Existing steel pipelines 31
7.7 Trunk water mains in unstable ground 32
7.7.1 General 32
7.9 Pipeline anchorage 32
7.9.2 Thrust Blocks 32

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

7.9.2.4 Timber and recycled plastics thrust blocks 32
7.9.5 Restrained elastomeric seal joint water mains 32
7.10 Bulkheads and trenchstops 32

8. Appurtenances **32**

8.1 Valves – general 32
8.2 Stop valves 33
8.2.1 Product specifications 33
8.2.2 Installation design and selection criteria 33
8.2.2.2 Gate valves 33
8.2.2.3 Butterfly valves 33
8.2.3 Stop valves for transfer/distribution mains 34
8.2.6 Bypass of stop valve 34
8.2.7 Stop valves - location and arrangements 34
8.2.7.1 General 34
8.2.7.3 Arrangement 2 34
8.4 Air valves (AV) 35
8.4.2 Installation design criteria 35
8.4.4 Air valve size 35
8.4.7 Use of hydrants as an alternative to air valves 35
8.5 Non-return valves 35
8.6 Scours and pump-out branches 36
8.6.1 Location and arrangements 36
8.6.2 Design 36
8.6.4 Scours size 36
8.6.5 Scour location 36
8.7 Swabbing points 36
8.8 Hydrants 36
8.9 Disinfection facilities 36
8.10 Surface fittings 37
8.10.2 General 37
8.11 Appurtenance location marking 37
8.11.2 Marker Posts and Plates 37
8.12 Flowmeters 37

9 Design review and drawings **38**

9.2 Design drawings 38
9.2.1 General 38
9.2.3 Scale 38

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

9.2.4 Content of drawings 38
9.4 Recording of 'work as constructed' information 38
Part 2: Construction 39
11. General Construction 39
11.1 General 39
11.5 Protection of Property and Environment 40
11.5.2 Disused / Redundant Water Mains 40
12 Products and materials 40
12.1 Authorised products and materials 40
12.1.1 General 40
15. Pipe Laying, Jointing and Connecting 41
15.2 Horizontal and vertical deflections of pipes 41
15.2.3 Curving of pipe 41
24. Works as constructed details 41
25 Standard drawings 41
Appendices 42

Note: Section numbers in this document match, or are in addition to, those in the WSAA Water Supply Code of Australia (WSA 03-2011 V3.3)

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Introduction

0.1 Purpose

This document is part of a suite of Seqwater Engineering Standards which are in alignment with the Seqwater Quality Management System. Their purpose is to provide a consistent approach to the development, modification, and management of Seqwater infrastructure that is fit for purpose, economic over the life of the asset, and meets Seqwaters risk appetite and compliance requirements including Work Health and Safety obligations.

The purpose of this Engineering Standard is to describe Seqwater's specific requirements for planning, design and construction of water supply networks that vary from, or are in additional to, those detailed in the *Water Supply Code of Australia WSA 03-2011, Version 3.3* ("*WSAA Code*") published by the Water Services Association of Australia (WSAA). This document must be used in conjunction with the *WSAA Code* and all other documents referenced to assist in ensuring a fit for purpose asset.

This Engineering Standard is not intended to be relied upon solely for planning, design, and construction of works; advice from specialist engineers and/or manufacturers may also be required on a case-by-case basis.

0.2 Scope

This Engineering Standard applies to all Seqwater employees, contractors, suppliers and consultants working for or on behalf of Seqwater unless otherwise stated. It applies to all new assets and to all existing assets undergoing refurbishment or modification. It must be used in conjunction with other relevant Seqwater Engineering Standards and project specific documents to define the technical requirements for infrastructure design and construction.

Where single or discrete components of an existing non-compliant system are to be replaced, refurbished or modified, this standard should not automatically be applied to the entire system retrospectively, however consideration should be given, in consultation with relevant stakeholders, to the extent of the application of the standard outside of the components requiring replacement, refurbishment or modification, to ensure safe, economic, and fit for purpose infrastructure.

Seqwater Engineering Standards include Standard Specifications, Drawings, Procedures, Templates, Forms and Preferred Equipment Lists. Together they detail Seqwater's minimum requirements and recommendations to provide infrastructure that will be fit for purpose, safe, and cost effective to operate and maintain. However, compliance with these requirements and recommendations does not remove, and cannot be relied on as meeting, the designer's overarching responsibility for ensuring infrastructure designed is fit for purpose and safe to construct, operate, maintain, and demolish. The designer must exercise appropriate due diligence to identify and manage hazards so far as is reasonably practicable.

Designers must also ensure compliance with relevant Australian Legislation, Standards, Codes and Guidelines (including those produced by Water Services Association of Australia). Where no Australian Standard exists for a particular application, work must conform to the most current version of an industry accepted international standard.

Deviation from meeting the minimum requirements in this Standard Specification requires written agreement from Seqwater as per the deviation process detailed in Procedure X-PRO-STD-008 Asset Standards Management and Application. That process includes completion of an X-TMP-STD-022 Asset Standards Deviation Request Form

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

together with relevant supporting documentation, and submission by the Seqwater Project Representative to the Seqwater Engineering Mailbox. Where noted in this Standard Specification that Seqwater approval, agreement, or acceptance shall/must be sought, such approval, agreement or acceptance must be gained through the Seqwater Asset Standard Deviation process, as outlined above.

Responsibility for ensuring compliance with Seqwater Engineering Standards lies with those engaged in the management and execution of design, construction, and modification of Seqwater infrastructure. This includes modifications to the functional design of the infrastructure including technical changes made which would extend an asset outside of its design operating envelope and/or approved operation and maintenance practices.

Any ambiguities or conflicts identified between specific requirements within this Standard and project documents, another Seqwater Engineering Standard or Australian Legislation, Standards, Codes or Guidelines, must be brought to the attention of the Seqwater Document Owner as listed in the document footer, via the Engineering Mailbox, for clarification. Where it is proposed to proceed without meeting the requirements of this standard, agreement must be obtained via the Deviation Process, as outlined above.

Seqwater undertakes regular updates of its Engineering Standards. Before utilising this Engineering Standard the complete list of Seqwater Engineering Standards should be reviewed to ensure currency and applicability of standards to be applied to the works. These can be accessed on the Waternet Seqwater Engineering Standards & Framework page or from your Seqwater project manager, design manager, or engaging officer.

0.3 Definitions and abbreviations

Definitions for this Engineering Standard are as set out in Part 0 of the WSAA Code, “Glossary, Abbreviations and References”.

0.4 Operation

Sections are provided in this Engineering Standard corresponding to each Part of the WSAA Code (Part 1 “Planning and Design”, and Part 2 “Construction”). Each Part contains –

- Table of Contents listing sections that correspond to sections in the WSAA code plus additional sections as required.
- In each section, a description of Seqwater requirements where different from, or additional to, those of the WSAA Code for the sections listed.

In all other aspects not referenced in this Engineering Standard the requirements of the WSAA Code are Seqwater’s requirements and are deemed to be included in this Engineering Standard.

A copy of the *WSAA Water Supply Code of Australia (WSA 03-2011, Version 3.3)* is available from the Water Services Association of Australia via www.wsaa.asn.au

The user can refer to the Table of Contents in each Part of this Engineering Standard to establish where Seqwater has requirements that differ from. Or are additional to, those in the WSAA Code. The clause numbering of this Engineering Standard matches the WSAA Code, with additional clauses and sub-clauses added where necessary.

This document shall be read in conjunction with *D-GDE-STD-001 Seqwater Network Consent Guidelines* (GDE-00348) when used in relation to Third Party works requiring Seqwater’s written Consent. Those Consent Guidelines assist in providing the background of many Seqwater engineering requirements.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

0.5 Responsibilities

Designers and constructors are responsible for their respective aspects of the design and construction process. It is the designer/constructor's responsibility to justify with certified calculation, any proposed deviations from the requirements set out in the Water Supply Code of Australia, this Engineering Standard and any specific directions given by Seqwater for the particular project. The designer/constructor must obtain Seqwater engineering's written agreement for any such deviations as outlined in Section 0.2 Scope above.

0.6 Reference documents

The documents listed in Table 0-1 below and the requirements therein, are relevant to this Engineering Standard. In their latest editions, these documents form a part of this Engineering Standard unless amended by this Engineering Standard. Note that this is not an exhaustive list of documents relevant to the works.

Seqwater document listed can be obtained by contacting the Seqwater Project Manager or engaging officer for Seqwater projects, or by contacting Consents@seqwater.com.au for Third Party projects.

Table 0-1:- Reference and Related Materials

Description	Location
AS2566.2 Buried Flexible Pipelines – Installation	Intertek Inform via Waternet
AS5334 Climate change adaption for settlements and infrastructure – a risk based approach	Intertek Inform via Waternet
Bulk Water Supply Code (1/1/2013)	Local Government, Water and Volunteers
FRA-00011 X-FRA-STD-003 Asset Information Management Framework	REX
GDE-00348 Engineering Standard D-GDE-STD-001 Seqwater Network Consent Guideline	REX
MAN-00383 Engineering Management Manual	REX
PRO-00808 Contractor Management Procedure (HSW, Env & DWQ)	REX
PRO-01554 WTPs & Supply System - Disinfection of Water Mains Work Instruction	REX
PRO-01559 Supply System - Disinfection of Bulk Water Supply Reservoirs (Method 2) Work Instruction	REX
PRO-01560 Tools and Equipment Disinfection Procedure	REX
PRO-01617 Engineering Standard X-PRO-STD-009 Engineering Design, Construction, Operation and Maintenance Procedure	REX
PRO-01869 Disinfection of Pumps, Hoses, Vac Trucks, and Jet Rodding Equipment Work Instruction	REX
PRO-01872 Engineering Standard X-PRO-STD-002 Engineering Drawing Numbers Procedure	REX
PRO-01874 Engineering Standard X-PRO-STD-004 Development and Review of Asset Standards Procedure	REX

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Description	Location
PRO-02187 Engineering Standard X-PRO-STD-007 Drawing and Spatial Data Standards Procedure	REX
PRO-02190 X-PRO-STD-006 Asset and Equipment Identifier Procedure	REX
PRO-02205 Engineering Standard X-PRO-STD-008 Asset Standards Management and Application Procedure	REX
PRO-02490 Request for a New or Modified Bulk Water Customer Supply Point Procedure	REX
REG-01074 Engineering Standard X-LST-STD-001 Seqwater Preferred Equipment Register	REX
SPE-00322 Engineering Standard M-SPE-STD-006 Bulk Water Meters for Potable Water	REX
SPE-00323 Engineering Standard M-SPE-STD-003 Valves for Water Applications	REX
SPE-00346 B-SPE-STD-003 Commissioning Requirements	REX
SPE-00347 Engineering Standard M-SPE-STD-007 Meters for Non-Urban Water Supply	REX
SPE-00349 Engineering Standard B-SPE-STD-005 Functional Description Documentation	REX
SPE-00351 Engineering Standard B-SPE-STD-007 Process Flow Diagram and Piping and Instrumentation Diagram Requirements	REX
SPE-00352 Engineering Standard E-SPE-STD-001 Electrical Design and Construction	REX
SPE-00353 Engineering Standard I-SPE-STD-015 Instrumentation	REX
SPE-00361 Engineering Standard I-SPE-STD-013 Control Systems Design and Construction	REX
SPE-00366 Engineering Standard M-SPE-STD-002 Fixed Platforms, Walkways, Stairways and Ladders	REX
SPE-00367 Engineering Standard M-SPE-STD-001 General Mechanical	REX
SPE-00370 Engineering Standard S-SPE-STD-001 Reservoir Roofs	REX
SPE-00434 Engineering Standard M-SPE-STD-009 Flow Meters	REX
SPE-00442 Seqwater Baseline Security Measures Standard	REX
TEM-00216 Engineering Statement ES1-Design Form	REX
TEM-00224 Engineering Standard X-TMP-STD-022 Asset Standards Deviation Request Template	REX
Water Act (Queensland) 2000	Queensland Legislation
WSA 03-2011 Water Supply Code of Australia, Third Edition, Version 3.3 (Water Services Association of Australia)	WSAA

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

0.7 Disclaimer

Seqwater makes no representations or warranties, express or implied, as to the accuracy, completeness, or fitness for purpose of this document (including for planning, design, construction or compliance). Users are responsible for ensuring they are using the most current version of this document and all referenced documents. Seqwater is not responsible for any consequences arising from the use of outdated documents.

To the maximum extent permitted by law, Seqwater excludes all liability for any loss or damage including direct, indirect, consequential (loss of profit, loss of opportunity, business interruption, reputational damage, special, or punitive damages) arising out of or in connection with the use of, or reliance on, this document, whether in contract, tort (including negligence), statute, or otherwise. Where liability cannot be excluded, Seqwater's liability is limited, at its option, to resupplying the document or paying the cost of resupply.

This disclaimer is governed by the laws of Queensland, Australia. If any provision of this disclaimer is found to be invalid or unenforceable, the remaining provisions will remain in full force and effect.

Please also note that this Engineering Standard must only be used in conjunction with the *WSAA Code*. Further, the *WSAA Code* may be periodically updated. For current information, users should refer to the latest version located on the WSAA website.

0.8 Changes from previous version

This document will be regularly reviewed and updated in accordance with Seqwater Procedure *X-PRO-STD-004 Development and Review of Asset Standards*.

Table 0-2:- Changes from previous version

Section number	Change
General	Revised formatting to current Seqwater requirements. Revised title to better highlight that the Standard is a supplement to, and must be read in conjunction with, WSA03-2011 Water Supply Code of Australia. Updated Seqwater document and external document references where necessary. Minor amendments and clarifications throughout as required.
Introduction (0.1 - 0.9)	Updated boilerplate wording to current Seqwater Engineering requirements Update Legal Disclaimer in consultation with Seqwater Legal Services
1	Included reference to MAN-00383 Seqwater Engineering Management Manual for use in delivery of all Seqwater projects. Added references to Seqwater requirements for Functional Description documentation, P&ID Drawings, Asset Information documentation, and Commissioning requirements documentation. Added Design Report and Engineering Statement requirements. Updated Asst Design Life requirements consistent with other Seqwater Standards Added reference to Seqwater Electrical and Mechanical Engineering Standards.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Section number	Change
2	Additional requirements regarding temporary connections to Seqwater mains. Added consideration of SCADA requirements for pump stations. Additional requirement to consider access and chemical risks when siting WQFs.
4.3	Additional requirements regarding use of ductile iron pipe without loose polyethylene sleeving.
4.5	Additional requirements regarding use of PE Pipe.
4.8	Additional requirements regarding design of Cathodic Protection systems.
5.4.2	Amended requirements for protection (concrete encasement) of water mains previously in footpath or road shoulder and proposed to be located under a road pavement. Protection requirements to be assessed by Seqwater dependent on depth or cover and other site-specific factors.
5.4.3	Section on Water Mains in Road Reserves re-written for clarity.
5.4.4	Additional requirements for determining pipeline easement widths including allowing for future pipeline infrastructure requirements.
5.4.15	Requirement for brass kerb markers for road crossings.
5.4.16	Requirement for Detectable Marking Tape (with trace wire) to be used on non-metallic pipelines and associated infrastructure.
5.9	Requirement for hydraulic analysis for any new connections to assess the impact on Seqwater infrastructure and operations.
7.9	Added that recycled plastic thrust blocks shall not be used.
8.2	Requirements to comply with Seqwater Valve Standard and Seqwater Preferred Equipment List added. Additional details regarding use of valves with integral bypass added.
8.2.3	Removed allowance to increase Stop valve spacing to 10km for > DN900.
8.2.11	New section regarding use of Stop Valves for Confined Space isolation.
8.11	Requirement for Equipment Numbers and Operating Asset Labels added.
11	Added reference to MAN-00383 Seqwater Engineering Management Manual for use in delivery of Seqwater projects.
12	Updated table to include references to the new section on use of ductile iron pipe (4.3) and PE Pipe (4.5)

0.9 Verification

Compliance with this document may be verified by internal audit.

Notes

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Part 1: Planning and design

1. General

1.1 Scope

Planning and design of infrastructure projects by Seqwater and their contractors and suppliers shall be delivered in accordance with the Seqwater Engineering Standard X-MAN-STD-001 Engineering Management Manual (MAN-00383).

1.2 Planning and Design

1.2.2 Scope and requirements

Contingency plans developed in relation to item "(v) adaption responses to climate change" shall consider AS5334-2013 "Climate change adaption for settlements and infrastructure – A risk-based approach".

1.2.5 Detailed design

1.2.5.1 Designer's needs and responsibilities

Seqwater has a number of Standard drawings which can be provided. These detail minimum Seqwater requirements but are not suitable for construction without further engineering design detail, for example, design of reinforcement for concrete structures.

1.2.5.2 Requirements to be addressed

As well as the items listed in the *WSAA Code*, designers shall ensure the following additional aspects have been considered and where appropriate included in the design:

p) The infrastructure of other Utilities, or Agencies, which may be affected by the proposed work, are clearly marked on the design drawings and included in relevant reports.

q) The scope of work is to include all disconnection and/or connection and/or diversion of services necessary for the proper construction of the new facilities and their subsequent operation.

r) All work associated with the potholing and survey of services shall be carried out to the satisfaction of the appropriate authority; and

s) Fibre optic cabling, and cathodic protection infrastructure, installed parallel with the pipeline (unless approved otherwise by Seqwater).

t) Operational Philosophy including Functional Description Documentation where appropriate to describe how the asset is to be controlled from a process and control system perspective, as detailed in Seqwater *Engineering Standard B-SPE-STD-005 Functional Description Documentation* (SPE-00349).

u) The design of the works shall be carried out by or under the direct supervision of, and certified by, a suitably qualified and experienced Registered Professional Engineer of Queensland (RPEQ).

1.2.5.3 Design outputs

Design output for Seqwater infrastructure shall also include, but not limited to:

e) Design drawings to show, as appropriate, location of pump stations, reservoirs and buildings, materials used and size;

f) Detailed construction drawings are to include the location of all existing services;.

g) Detailed drawings and specifications including structural, electrical, mechanical, civil, process, and hydraulic design.

h) P&ID Drawings for pipelines that comply with the requirements of *B-SPE-STD-007 "Process Flow Diagram and Piping and Instrumentation Diagram Requirements* (SPE-00351) Section 9.6 "Major Transmission Pipelines".

i) Approved asset information equipment and asset numbers at 30% and 100% design as per *X-FRA-STD-003 Asset Information Management Framework* (FRA-00011) Table 1.

j) Commissioning details including Commissioning Strategy at 30% Design stage and Commissioning Plan at 90% Design stage as detailed in B-SPE-STD-003 Commissioning Requirements (SPE-00346);

k) Acquisition plans detailing any additional land and/or easement requirements that may be associated with the proposed works;

l) Operation and Maintenance Manuals which must include equipment startup/shutdown requirements, isolation steps, troubleshooting protocols, and OEM contact information for pumps, compressors and valves.

m) Design Report documenting the Basis of Design, design philosophy and assumptions, site investigations, all approved Deviations from Seqwater Engineering Standards, and Safety in Design activities undertaken during the design process and their outcomes including any residual risks Seqwater would be required to accept including likely mechanical failure modes (e.g. seal leaks, bearing wear, vibration issues) and recommended mitigation strategies (e.g. redundancy, remote monitoring).

n) Completed and RPEQ Certified Seqwater Engineering Statements ES-1 Design and ES-2 Construction to document compliance with the Professional Engineers Act (Qld) for the design and construction of the works.

1.2.6 Design life

Unless agreed otherwise infrastructure asset design lives shall be in accordance with Table 1.21.2 as modified herein.

Table 1.2:- Asset design life

Infrastructure asset type	Minimum Design Life (years)
Metallic water mains (e.g. MSCL, DICL, SS) including all appurtenances (e.g. offtake structures, pits, pipe support structures, thrust blocks, etc.).	100
Plastic water mains (e.g. PE, PVC)	50
Facility structures (e.g. Reservoirs, Pump stations, amenities buildings, etc.).	80
Platforms, walkways, stairways and ladders (Metallic / FRP)	50 / 20

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Infrastructure asset type	Minimum Design Life (years)
General mechanical equipment (e.g., small pumps & motors, valve actuators, pressure vessels, compressors, cranes, hoists, winches)	25
Gate Valve, Air Valve	Pipeline life
Butterfly Valve (>DN150 / <DN150)	50 / 25
Non-Return Valve, Hydraulic Automatic Control Valve	25
Flow Meters	15
Large Pumps (>500 kW)	50
Metalwork and Structural Steel	50
Electrical equipment	20
Instrumentation	10
Control Systems (Comms Devices / Process Controllers / System Cabinets)	10 / 15 / 30

1.2.7 Instrumentation and control systems

All designs incorporating instrumentation, monitoring and control equipment shall comply with Seqwater's Engineering Standards I-*SPE-STD-015 Instrumentation* (SPE-00353) and *I-SPE-STD-013 Control Systems Design and Construction* (SPE-00361).

1.2.8 Electrical equipment and systems

All designs incorporating electrical systems shall comply with Seqwater Engineering Standard E-SPE-STD-001 Electrical Design and Construction (SPE-00352).

1.2.9 Mechanical equipment

All designs incorporating mechanical equipment shall comply with Seqwater Engineering Standard M-SPE-STD-001 General Mechanical (SPE-00367). Flow Meters shall comply with Seqwater Engineering Standard *M-SPE-STD-009 Flow Meters* (SPE-00434) as well as either *M-SPE-STD-006 Bulk Supply Meters for Potable Water* (SPE-00322) or *M-SPE-STD-007 Meters for Non-Urban Water Supply* (SPE-00347) as appropriate for the application.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

2 System planning

2.3 Demands

2.3.1 General

Seqwater is a Bulk Water Transfer Authority; so peak hour and peak day demands are not as relevant as for water reticulation businesses. Pipelines shall be designed to deliver flows that comply with Seqwater's requirements.

2.5 System hydraulics

2.5.3 Operating pressures

2.5.3.2 Maximum allowable service pressure

Where Seqwater water mains supply directly to a water retailers Water Supply Zone (WSZ) or consumer, the maximum allowable operating pressures are set by the water retailer.

2.6 Water quality

2.6.1 General

Water Quality will be measured at the distribution main offtakes and at other required locations as specified by Seqwater.

2.7 Separation of drinking and non-drinking water supply systems

2.7.2 Temporary cross links

Temporary cross links between a drinking water system and a non-drinking water system are not permitted.

Any temporary connections to the Seqwater drinking water networks require Seqwaters written approval and will be subject to suitable engineering conditions including backflow prevention requirements. This includes, for example, services for an Seqwater project site or filling of a new pipeline for pressure testing.

2.8 Pumping stations

2.8.2 Design Factors

2.8.2.2 Site related factors

Additional site factors to be considered when locating pump/s shall include:

f) Ensure all structures have a flood immunity of 0.5% Annual Exceedance Probability (AEP) approximately equivalent to a flood with an Annual Recurrence Interval (ARI) of 200 years (commonly referred to as a Q100 flood) .

g) Drainage at the site in accordance with the requirements of the Queensland Urban Drainage Manual.

h) Ensure access to critical electrical gear during flood events is provided at all times.

i) Attention to Seqwater requirements for SCADA connections as per I-SPE-STD-013 Control Systems Design and Construction (SPE-00361).

j) Obtain approval from the Local Government for any buildings to be located on the flood plain.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

k) Filling of the flood plain shall not be considered or permitted without the specific and written approval of the Local Government; and

l) Unobstructed line of sight from electrical switchboard.

2.8.2.3 Service related factors

Additional service related factors to be considered in the design of a pumping station shall include:

i) Access to electrical cabling and communication cabling.

j) Site access to the pumping station site for light and heavy vehicles including suitable clearance for maintenance tasks where appropriate; and

k) Security fencing.

2.10 Trenchless techniques for pipelaying

In addition to those listed in *WSA 03-2011*, trenchless techniques shall be evaluated for alignments:

d) passing through:

(iv) areas of cultural heritage significance; and

(v) temporary works outside easement, or

(vi) areas which may require special arrangements to secure access.

2.13 Water quality facilities

Water quality facilities are used within the transfer main system to ensure that water quality is maintained to Seqwater standards.

A concept or detailed water quality facility design shall document the design basis and technical inputs to the design.

The Planner/Designer shall address the following factors/requirements in the water quality facility design:

a) Designed for the range of flows expected.

b) Standby items of equipment to be provided in addition to the duty units, with automatic controls to alternate between duty and standby functions.

c) Undertake an investigation of flooding and drainage at the site.

d) Ensure all structures are constructed with a flood immunity of 0.5% Annual Exceedance Probability (AEP) approximately equivalent to a flood with an Annual Recurrence Interval (ARI) of 200 years.

e) Ensure access to critical electrical infrastructure during flood events is provided at all times.

f) Ensure suitable access for operations and maintenance personnel including light vehicles.

g) Include risk assessment in relation to chemical storage and other risks, with a focus on identifying and mitigating potential impacts to adjacent sensitive receptors and land uses (e.g. residential areas).

h) Obtain approval from the relevant Local Government for any buildings to be located on the flood plain; and

i) Filling of the flood plain shall not be considered or permitted without the specific and written approval of the relevant Local Government.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

3 Hydraulic design

3.1 Sizing

3.1.3 Empirical sizing of reticulation mains

Water main size of 225mm diameter is not accepted for Seqwater infrastructure as this is a non-standard size and therefore fittings are not readily available.

3.8 Pipeline components minimum pressure class

The minimum pressure class for water pipe and fittings shall be Class 16. For DICL pipes, the required class shall be PN35 to provide a larger allowance for corrosion protection (the fittings do not have to be Class 35). In addition to the above, the pipe and fittings pressure class shall always be greater than the design pressure (including transient pressures).

4 Products and materials

4.3 Ductile Iron Pipeline Systems

4.3.7 Coatings

As stated in Section 4.3.4, Loose Polyethylene Sleeving (LPS) shall be installed for all bituminous coated ductile iron pipes applied in accordance with AS 3681 to provide adequate performance against external corrosion. Contractors are required to repair any damaged sleeving in accordance with the pipe and/or fitting manufacturer's instructions.

For ductile iron pipes with an alternative coating system, Seqwaters requirements on the need to install LPS as an additional corrosion protection measure are detailed in Section 4.3.8 below.

4.3.8 Soil Assessment for Ductile Iron Pipe Without Loose Polyethylene Sleeving

New generation ductile iron pipes feature an external coating of either thermally sprayed metallic zinc or zinc-aluminium alloy with a polymeric topcoat coating system. These coating systems have been found to be effective in most soils around Australia from preventing external corrosion without the need for LPS. However before proceeding without LPS Seqwater requires that the soil properties along the pipeline route are assessed to ensure their suitability, identify any areas of highly aggressive soil that are not suitable for installation without LPS, and ensure the required 100-year design life is achievable.

For extremely aggressive soils the pipes can be coated with polyurethane or an extruded high-density polyethylene coating to isolate the ductile iron from the environment.

4.3.8.1 Soil Parameters and Conditions to be Assessed

For assessing the soil aggressivity on metallic pipes, the three (3) critical soil parameters are:

- Resistivity (or conductivity)
- pH level
- chlorides concentration

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Note: Soil resistivity (ohm.cm) may be calculated from soil conductivity (S/m) using equation 1 below:

$$Resistivity\ (ohm.cm) = \frac{1}{Conductivity} \times \frac{1}{100}\ (S/m) \qquad (1)$$

As well as assessing these critical parameters, the pipeline route shall also be assessed to determine whether it contains any of the following conditions:

- acid sulphate soils,
- contaminated soils including waste from mining, processing, or manufacturing industries such as refuse, cinders, ash, slag, liquid manure, dairy waste or other industrial effluents,
- stray currents from industrial plants or equipment using direct current such as cathodically protected structures and electrical trains/trams.

4.3.8.2 Acceptable Test Methods

All acceptable test methods are detailed in Table 4.2 below.

Table 4.2 Acceptable test methods

Parameter	Acceptable Test Methods (Note 1)		
	AS	CSIRO	Other
Resistivity	AS 1289.4.4.1	-	ASTM G57
Conductivity	-	3A1 EC of 1:5 soil/water extract	-
pH	AS 1289.4.3.1	4A1 pH of 1:5 soil/water suspension	-
Chlorides	-	5A1 Chloride – 1:5 soil/water extract, potentiometric titration	-

Note 1 – Only one test method for every parameter is required for each soil sample.

4.3.8.3 Testing Frequency and Location

A geotechnical assessment shall be undertaken to determine soil types along the proposed pipeline route including carrying out soil testing of the critical soil parameters as outlined in Section 4.3.8.1. Soil testing shall be undertaken at a minimum of every 500m along the route or more frequently as required to ensure all soil types and site conditions are assessed. The assessment shall also determine whether there are any areas of acid sulphate soil, contaminated soil, or potential for stray currents.

All soil samples for testing or measurements shall be obtained from the approximate depth of the pipeline invert. Additional testing shall be undertaken in locations of waterways, wetlands, polluted soils, or where soil conditions are variable.

4.3.8.4 Acceptable Testing Organisation

Only test results produced by National Association of Testing Authorities (NATA) accredited testing organisations are acceptable.

4.3.8.5 Supplier Acceptance

The combined results of the assessment and testing must be reviewed by the pipe supplier, who shall issue a certificate indicating the level of suitability and expected asset life for the selected product/s, which the designer can then use to support their design certification.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

4.3.8.6 Soil Condition Criteria by Coating Type

Acceptable soil properties to allow installation of ductile iron pipes without LPS according to the external coating type are summarised in Table 4.3 below.

Table 4.3: Acceptable Soil Properties for DI Pipe without Loose Polyethylene Sleeving (LPS)

Parameter	Ductile iron pipes external coating system (Note 2)		
	Zn coating (200g/m^2 or higher)	Zn-Al coating (400 g/m^2 or higher)	PU coating (⩾ 800 µm) extruded PE coating (⩾ 1.8mm)
Resistivity	≥2500 ohm.cm	≥500 ohm.cm	No limit
pH	≥6	≥5	No limit
Chlorides concentration	≤5,000 ppm	≤50,000 ppm	No limit
Acid sulphate soil	Not allowed	Not allowed	Allowed
Contaminated soil (Note 1)	Not Allowed	Not allowed	Allowed
Stray currents potential (Note 1)	Not Allowed	Not allowed	Allowed

Note 1 – Refer Section 4.3.8.1 above for the definitions of contaminated soil and stray currents potential.

Note 2 – Loose polyethylene sleeving (LPS) is required for all ductile iron pipes with bituminous coating to warrant adequate performance against external corrosion

4.3.8.7 Documentation

The Design Report for the pipeline shall document the basis for selection of the proposed ductile iron pipe product/s to be installed without LPS, including the following:

- product technical data sheet relating to the proposed pipe product/s and specifying the composition of the external corrosion protection system,
- geotechnical assessment report documenting soils encountered along the proposed pipeline route including results of soil testing and any adverse conditions as per Section 4.3.8.1,
- pipe suppliers certification of the proposed pipe product/s suitability for the given soil conditions to achieve the required design life of 100 years.
- an Engineering Statement ES1-Design form (TEM-00216) certified by the responsible RPEQ design engineer covering the suitability of the proposed ductile iron pipe product/s for the given soil conditions to achieve the required design life of 100 years.

4.5 PE Pipeline Systems

4.5.3 Limitation on Use of PE Pipeline Systems

To address premature failure of ordinary PE100 polyethylene pipe and the limited experience with new PE100 resins, PE100 is not to be used where there is a viable alternative pipe material.

PE100 may be accepted, subject to the approval of a Deviation Request as described in X-PRO-STD-008 Asset Standards Management and Application (PRO-02205), where PE100 is the only viable option for the given application, however, the minimum requirements listed below must be met. Note that meeting these minimum requirements does not imply acceptance.

PE Pipes must:

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

a) Not be used for chlorinated water capable of reaching 25°C or higher;

b) Be de-rated for pressure by an oxidation factor of 0.45 applied separately to any temperature and fatigue de-ratings applied, when used in a chlorinated water application;

c) Be manufactured from a resin with Disinfection Resistance demonstrated using the method described within this section below, when used in a chlorinated water application;

d) Not be used for water with elevated chlorine levels (>0.6 mg/L free-chlorine or >3 mg/L chloramine) or very low pH (<6.5); and

e) Have repair fittings readily available, which can be problematic for large diameter pipes.

All polyethylene (PE100) pipes and stub-flanges used in chlorinated water applications must be entirely fabricated from resins that are both:

i. Classed as High Stress Crack Resistance (HSCR) as per PIPA document POP016; and

ii. Demonstrated to be Disinfection Resistant in accordance with the method described below.

Where it is necessary to demonstrate Disinfection Resistance of a PE resin, this shall be evaluated using the following method, which is based on adopting elements from a number of internationally recognised standards, specifically ASTM F2263 and ISO 9080. The method consists of:

1. Conduct testing in accordance with ASTM F2263 under the following conditions:
    - ORP ≥ 825 mV
    - 6.5 ≤ pH ≤ 8.0
    - Free chlorine concentration = 4.3 mg/L
    - Pipe DN ≤ 20mm
2. Generate a 4-parameter model via multiple linear regression in accordance with ISO 9080 with a minimum R^2 value of 0.9. The 4-parameter model may be reduced to a 3-parameter model in accordance with the requirements of ISO 9080.
3. Plot the failure curve for each temperature listed in Table 4.3 below.

Table 4.3: Baseline PE100 resin performance

Temperature (°C)	Minimum Life (years)	Design Factor	Equivalent Wall Stress (MPa)
20	100	1	8
30	100	1.1	7.3
40	50	1.2	6.7

A PE resin shall be considered Disinfection Resistant if, for each temperature and stress combination listed in Table 4.3 the predicted time to failure exceeds the corresponding minimum life listed in Table 4.3.

Fittings for PE pipelines shall not be of PE100 material with the exception of stub flanges. Stub flanges shall be butt-fusion-weld type, de-rated by the same factor as applied to the adjoining PE pipe in addition to any other

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

applicable derating, and be fabricated from the same resin as the adjoining pipe. Bends and tees shall be DICL or MSCL with suitable coatings for the soil conditions.

4.6 Steel pipeline systems

4.6.3 Joints

Internal joint reinstatement is to be undertaken for all joints in pipes larger than DN600 in accordance with Seqwater Standard Drawing D-DWG-STD-00008.

Deflections at weld collars shall not exceed ½° per joint.

Deflections at rubber ring joints shall be as per pipe manufacturer's recommendations.

4.7 GRP pipeline systems

GRP pipes and fittings shall not be used for water mains.

4.8 Protection against degradation

4.8.5 Cathodic protection

Cathodic Protection (CP) is required for all steel pipelines. When the steel pipeline total length does not exceed 20 metres, CP may not be required, subject to Seqwater engineering approval.

Where required to prevent electrical current from continuing along a pipeline (e.g., at flowmeters, valves in pits, etc.) or draining to ground via equipment in direct ground contact (e.g., buried valves), Electrical Isolation of the fittings shall be provided at the flanges.

Details of Electrical Isolated Joints and Cathodic Bonding Cables are shown in Seqwater Standard Drawing *D-DWG-STD-00009 and E-DWG-STD-00001* respectively.

When steel mains are laid in proximity to power lines, e.g., high voltage transmission lines and railway overhead power lines, the design of cathodic protection systems shall consider Low Frequency Induction and Earth Potential Rise.

Where fittings are located, earth mats may be required.

All Cathodic Protection systems must comply with the requirements of the Electrical Safety Regulation 2026 (Qld), designed and installed in accordance with AS2832.1, and be registered with the regulator where applicable. Designs shall be prepared and/or supervised by a suitably qualified and experienced Registered Professional Engineer of Queensland (RPEQ).

4.8.8 Bolted connections

Bolted connections shall comply with Seqwater Standard Drawing *D-DWG-STD-00009*.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

5 General design

5.1 General requirements

5.1.1 Design tolerances

Horizontal alignment shall be referenced to the Australian Map Grid coordinate system, Geocentric Datum of Australia 2020 (GDA 2020), Map Grid of Australia Zone 56 (MGA 56).

For buildings and structures, the accuracy of all surveys should comply with standard cadastral and/or engineering survey conventions.

The survey shall be connected into the cadastre at sufficient intervals to enable plotting of all subjects, and abutting, cadastral parcels.

5.1.4 Environmental considerations

Full details of the environmental mitigation works shall be shown on Design Drawings and/or Project Specification and presented to Seqwater for approval.

Land subject to Vegetation Protection Orders (VPO) shall be avoided.

5.3 Water main access

Water main access facilities for access into water mains shall be coincident with Air valves tees where practicable. Air valve pit typical arrangement details, including DN600 access branch, are detailed on Seqwater Standard Drawing D-DWG-STD-00006.

Buried access facilities are not acceptable.

5.4 Location of water mains

5.4.2 Water Mains in Road Reserves

5.4.2.1 General

When a Water Main is to be located in a road reserve, written approval of the alignment and level of the main shall be obtained from the road owner. Liaison with the road owner should commence as early as possible in the planning and design of a new Water Main to determine the road owners position in relation to allowing the water main to be located in the road reserve and what conditions may apply.

Due to their size and operating pressures; unless otherwise approved by Seqwater Trunk Water Mains (defined in WSA03-2011 as generally ≥ DN 375) located within a road reserve shall be constructed within the road shoulder or preferably under road pavement in the kerb side lane of the carriageway[1].

[1] This recommendation is made on the basis of the size and operating pressure of Trunk Water Mains. Due to these provisions, the recommended location will minimise the level of damage to other infrastructure if failure occurs. Further, as they transport bulk water supply, it is imperative that they can be rapidly and efficiently repaired if undergoing failure. The recommended location also minimises the potential of damage to them when other underground services are being constructed.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

When a Water Main is to be located in the road shoulder, the spacing between the centre line of the main and the kerb shall be sufficient to enable a tracked vehicle to excavate the Water Main for repairs or replacement works without damaging the adjacent kerb and channel.

Water mains shall not be laid under a concrete footpath, concrete bikeway, concrete pavement or roadway constructed of concrete, unless the water main is concrete encased to Seqwater's engineering satisfaction. Seqwater may consider approval of alternative measures which allow for ease of excavation of the water main for emergency repairs.

Where applicable, water mains shall be laid straight through roundabouts.

Where a water main was originally laid in a footpath or road shoulder, but with road widening is proposed to be located in a carriageway, the water main shall either be relocated or, if left in place, may require additional protection measures to be installed (e.g. concrete encasement) depending on the location, depth of cover and/or other site specific factors as determined by Seqwater.

Where an existing Asbestos Cement Water Main is proposed to be located in a carriageway, the subject water main shall be replaced with an approved pipe material.

All water main appurtenances must be accessible from the finished surface level for maintenance and operational activities at all times and must not be restricted by any proposed road upgrades or other improvements. Minimising traffic impacts and the need for traffic control when undertaking operational and/or maintenance activities shall also be considered when determining the location of all appurtenances.

5.4.2.2 Location in footway

To minimise the potential of contamination, where possible, a Trunk Water Main shall be located on the alternate side of the street to the sewer location.

5.4.3 Location in other than dedicated public road reserves

An easement dedicated to Seqwater is required if the pipeline cannot be laid in a road reserve or other suitable public land.

5.4.4 Water mains in easements

Water mains are not to be located in an easement to reduce capital costs where a suitable route in a road reserve is available.

If a water main cannot be placed in a road reserve or other suitable public land an easement will be required. When an easement is required, consideration shall be given to long term access arrangements for operational and maintenance purposes. This would typically see trunk mains/s within an easement not located centrally, but offset either side of centre.

The width of a pipeline easement shall be determined based on an assessment of site characteristics while allowing sufficient width to ensure constructability and safe operation and maintenance of the infrastructure to be incorporated within the easement. This shall include consideration for any planned future infrastructure to be incorporated into the easement which shall be determined in consultation with Seqwater Strategic Planning and Asset Planning teams. As a minimum pipeline easements shall be at least 15 metres wide; and at least equivalent to the width of a surrendered Seqwater Easement where applicable.

Where appurtenances are located in an easement (e.g. air valves, isolation valves, flowmeters etc.), consideration shall be given to providing access for their maintenance. Where scour valves are located in an easement

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

consideration shall be given to obtaining easements for the drainage path of any water which may leave the pipe easement; or, where discharge to the environment is not allowable, provision for safe removal by tankering.

The Developer, or persons requiring the placement of an Seqwater asset in an easement, shall arrange for the provision of that easement and registration of such easement to Seqwater.

5.4.9 Crossings

5.4.9.1 General

The design of water main crossings of controlled access roads (e.g., motorways, freeways and major arterials), railways and waterways shall include mechanical protection of the Main. Due to adverse effects to future access; the installation of pre-cast reinforced concrete slabs over the water main as a means of providing mechanical protection is not permitted. Mechanical protection shall be provided by full concrete encasement of the water main (Refer to Clause 7.6.2)

All surface fittings shall be positioned outside the controlled road reserve, rail corridor or waterway embankments.

The design shall include drawings showing the reinstatement of road pavement layers for open cut crossings. These details must be approved by the relevant road authority.

Water crossings shall be designed as buried pipelines using trenchless techniques unless approved otherwise by Seqwater.

5.4.9.2 Requirements for encased pipe installations

For further information, refer to Clause 7.6.2.

5.4.10 Railway reserves

Where an Seqwater asset is to be located in a rail reserve a Wayleave Agreement or suitable tenure is required between the Railway Authority and Seqwater.

5.4.11 Crossings of creeks or drainage reserves

Water mains which cross waterways, dams and drainage reserves shall be positioned below ground level. Unless approved otherwise via the Deviation Request process as outlined in X-PRO-STD-008 Asset Standards Management and Application (PRO-02205) the construction of the crossing shall be welded mild steel cement lined pipe which is fully encased in suitably reinforced concrete or grouted inside an enveloper pipe. The launch and retrieval pits shall be located outside any environmentally sensitive areas.

5.4.12 Overhead power lines and transmission towers

When this clause is relevant, a report detailing the procedures to be adopted for design, construction and maintenance of the water main shall be provided by a Registered Professional Engineer of Queensland.

Where a water main is to be located within a power easement, the pipeline alignment lateral offset between edge of power easement and centreline of pipeline is to be 5 m unless otherwise agreed with the power company.

5.4.13 Water mains in conjunction with landscaping and/or other development

As detailed in Section 5.4.9.1 above; provision of a structural slab over the main as a means of providing mechanical protection is not acceptable as it will restrict future access for maintenance/operational purposes.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

5.4.15 Location markers

Marker posts with location markers shall be located as per the requirements of Seqwater Standard Drawings D-DWG-STD-00003 and D-DWG-STD-00004.

Brass Kerb Markers with the letters “WM” cast in shall be positioned on each kerb at all water main road crossings.

5.4.16 Marking tape

5.4.16.2 Mains

Marking tape shall be installed above all buried Trunk Water mains and fibre optic conduits as per the details shown in Seqwater Standard Drawing D-DWG-STD-00001. Detectable marking tape containing a trace wire shall be used where the water main or conduits are non-metallic.

5.6 Shared trenching

Shared Trenching shall not be permitted.

5.9 Connection of new mains to existing mains

The first valve on the branch to a new water main shall be at minimum cover. For steel mains, the branch shall be welded steel pipe up to the flange which connects to this first valve.

Where new Bulk Supply Point offtakes are proposed, Steady State Hydraulic Analysis and Transient Hydraulic Analysis reports shall be produced. These reports shall detail the pressure and flow of the new connection at the Bulk Supply Point and the impact on steady state and transient hydraulics of the Seqwater infrastructure being connected to. Refer also PRO-02490 Request for a New or Modified Bulk Water Customer Supply Point Procedure for further details.

Offtake designs shall include 2 isolation valves directly off the Seqwater water main line tee, with DN300 riser pipe and ball valve for de-pressurisation of pipe section between valves. Offtake design shall also incorporate:

- A flowmeter installed in a pit,
- Adequate straight lengths of pipe upstream and downstream of the flow meter to ensure meter accuracy in accordance with M-SPE-STD-006 Bulk Supply Meters for Potable Water (SPE-00322) or M-SPE-STD-007 Meters for Non-Urban Water Supply (SPE-00347).
- An above-ground section of pipework housed in a building including isolation valves, rate of flow control valve and non-return valve.
- Safety relief valve(s) may be required depending on the pressure class of receiving main.
- Pressure transducers shall be located at all offtakes.

5.11 Property services

Property water supply connections shall not be connected directly to an Seqwater water main unless approved in writing by Seqwater. Maintenance and metering of this connection must be carried out by the relevant Water Supply Distributor-Retailer. The design of the property connection must be approved by Seqwater. Seqwater cannot guarantee regular supply to a property water service directly connected to Seqwater water main.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

5.12 Obstructions and clearances

5.12.5 Underground obstructions and services

5.12.5.1 General

The Designer must confirm the position and depth of Seqwater's infrastructure (including any fibre optic conduit, and cathodic protection infrastructure) has been positively and accurately located by approved non-destructive methods such as hydro-vacuum potholing systems. Ground Penetrating Radar is not an approved method for positive and accurate identification).

5.12.5.2 Clearance requirements

For trenched and trenchless installations, clearances from other service utility assets to Seqwater water mains shall not be less than (and preferably exceed) the minimum vertical and horizontal clearances shown in Table 5.5. Where new services interfere with an existing thrust block's integrity, then an engineering assessment is required to determine the minimum clearances (the minimum clearance shall be the larger of Table 5.5 or the determined value).

Table 5.5:- Required clearances between Seqwater water mains and other underground services

Service type	Minimum Horizontal Clearance to Seqwater Water Main (mm)			Minimum Vertical Clearance to Seqwater Water Main[1] (mm)	
	⩽ DN200	> DN200 and < DN600	⩾ DN600	< DN375	⩾ DN375
Water mains ⩽DN375[2]	300[3]	600	1000	150	300
Water mains >DN375[2]	600	1000	2000	300	500
Gas mains - Low pressure	300[3]	600	1000	300	500
Gas mains - High pressure	5000	5000	5000	300	500
Telecommunication conduits and cables	300[3]	600	600	150	150
Electrical conduits and cables	500	1000	1000	300	500[7]
Electrical and communication poles	600	600	2000	N/A	N/A
Drains <DN300	300[3]	600	1000	150[4,8]	150
Drains ⩾DN300	300[3]	600	2000	150[4,8]	500[4,8]
Sewers <DN200[4,8,9]	1000[5]/600	1000[5]/600	1000	500	500
Sewers ⩾DN200[4,8,9]	1000[5]/600	1000[5]/600	1000	500	500
Kerbs	150	600[6]	600	900	900

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Notes

1. Vertical clearances apply where water mains cross one another and other utility services, except in the case of sewers where a vertical separation shall always be maintained, even when the main and sewer are parallel. The water main should always be located above the sewer to minimise the possibility of backflow contamination in the event of a main break.
2. Water main includes mains supplying drinking water or non-drinking water.
3. Clearances can be further reduced to 150 mm for distances up to 2 m when passing installations such as concrete bases for small structures, providing the structure is not destabilised in the process. The clearance from timber poles should be at least 300mm.
4. Sewers and Drains should cross under water mains. For cases where there is no alternative then the sewer or drain should be joint free and continuous between manholes. It may be necessary to concrete encase the Seqwater water main as per Standard Drawing No. D-DWG-STD-00001 (encasement to extend 2 m on both sides of the utility service crossing).
5. Where a sewer is at the minimum vertical clearance lower than the water main (500mm) maintain a minimum horizontal clearance of 1000mm. This minimum horizontal clearance can be progressively reduced to 600mm as the vertical clearance is increased to 750mm.
6. Clearances from kerbs shall be measured from the nearest point of the kerb.
7. An additional clearance from high voltage electrical installations should be maintained above the conduits or cables to allow for a protective barrier and marking to be provided as per the requirements of an LFI and EPR investigation (to be approved by Seqwater).
8. When the water main is concrete encased a minimum vertical clearance of 150 mm is required between the sewer/drain and the concrete encasement.
9. If the sewer cannot be maintained at the minimum vertical clearance below the water main, then the horizontal clearance must be amended in accordance with an assessment of the associated risks to water quality.

5.12.6 Deviation of water mains

5.12.6.1 General

Using pipe joint deflections to achieve a deviation around an object is not permitted. Bend fittings or welded SCL pipes shall provide the pipe deviation.

5.12.6.2 Horizontal deviation of water mains

Refer to Clause 5.12.6.1. Figures 5.12 and 5.13 from WSA03 are not permitted.

5.12.6.3 Vertical deviation of water mains

Refer to Clause 5.12.6.1. Figure 5.15 is not permitted. Flange fittings shall be fully wrapped, refer to D-DWG-STD-00009.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

5.12.6.4 Curving of pipes to avoid obstructions

Curving of uPVC pipe without bends is not permitted. Curving of PE pipes including limiting the radius of curvature shall be in accordance with PIPA Guideline POP202.

7. Structural design

7.4 External forces

7.4.2 Pipe cover

The required (and minimum) cover for pipelines not laid in a road carriageway shall be:

- DN 63 – 150 600 mm
- DN 200 – 300 900 mm

When DN 63 - 300, is laid in a carriageway the depth of trench shall not exceed 1500mm without prior approval. All levels are relative to the finished surface level.

The minimum cover requirements for pipes >DN300, from the finished surface level to the top of the pipe, shall be:

- 900mm in parkland/car parks and private property
- 1200mm in industrial areas/farming land and roads

The maximum cover shall not exceed 2.0 metres without prior engineering approval from Seqwater.

If the pipeline has to exceed maximum cover, then extra pipe protection may be required by Seqwater (e.g., full concrete encasement) with the aim of protecting the pipe from corrosion and other impacts that would require excavation for repairs.

Where a smaller pipe connects to a larger pipe, then the smaller pipe must achieve the required depth within 20 metres. This is achieved by pipe deflection; however, if adjacent services or pipe deflections do not allow this, then either:

- welded SCL bends shall be used when the larger pipe is SCL, or
- flanged DICL bends shall be used when the larger pipe is DICL.

7.5 Geotechnical considerations

7.5.1 General

Embedment support shall be suitable for the location and constraints encountered on site and shall generally comply with the requirements of Seqwater Standard drawings.

A geotechnical investigation including field testing is required to determine ground conditions before detailed design of Seqwater infrastructure is undertaken.

Typical trench details are as per Seqwater Standard drawings D-DWG-STD-00001 and D-DWG-STD-00002 as follows:

- Type 1 for normal conditions
- Type 2 for poor ground conditions
- Type 3 for low strength surround

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

- Type 4 for concrete encasement
- Type 5 for reinforced concrete encasement (where side support or foundation are inadequate)
- Type 6 for sealed road construction
- Type 7 for unsealed road construction
- Type 8 for trenchless installation

Treated Hardwood piles are not permitted.

7.6 Concrete encasement

7.6.2 Requirements

Concrete encasement shall be as per the requirements of Standard Drawings D-DWG-STD-00001 and D-DWG-STD-00002 as follows:

- Type 4 Construction for non-reinforced concrete encasement,
- Type 5 Construction for reinforced concrete encasement (for use where trench side support or foundation is inadequate), or
- Type 8 Construction for trenchless construction.

Mechanical protection shall be welded mild steel cement lined pipe which is encased in concrete or grouted inside an enveloper pipe.

For major roadways and railways, mechanical protection shall extend a minimum of 2000mm beyond the toe of the formation/embankment or to the property boundaries.

For water ways, mechanical protection shall extend a minimum of 2000mm beyond the riparian zone.

Where concrete encasement of a Seqwater main is required by Seqwater for new services crossing the Seqwater main, the concrete encasement shall extend a minimum of 2000mm beyond the outside edge of the new service.

Non-flexible pavements (i.e. rigid concrete pavements) over the top of an Seqwater water main will not be acceptable as mechanical protection.

Concrete encasement works shall be carried out in one continuous pour without horizontal joints. Concrete shall be poured on only one side of the pipe until the concrete has risen at least 25% of the pipe diameter on the opposite side. Vertical construction joints compliant with the requirements of Standard Drawing D-DWG-STD-00001 will be accepted.

Rocker pipes (maximum length of 600mm or 2 x DN) may be required at each end of the transition from the concrete encased pipe to the natural trenched section of the main.

7.6.3 Encased Steel Pipelines

7.6.3.2 Existing steel pipelines

For major roadways and railways, mechanical protection shall extend 2000mm beyond the road/rail formation /embankment or to the property boundaries.

For water ways, mechanical protection shall extend 2000mm beyond the riparian zone.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

7.7 Trunk water mains in unstable ground

7.7.1 General

All Trunk Water mains proposed to be located within unstable ground, slip areas and mine subsidence areas shall be the subject of a risk assessment. Mitigation measures shall include monitoring of any further land movements and the effect on Seqwater assets. Refer also 7.5 Geotechnical considerations.

7.9 Pipeline anchorage

7.9.2 Thrust Blocks

Preferred restraint is to be provided using concrete thrust blocks. When the thrust block volume exceeds 30 m³, an alternative thrust restraint shall be investigated. All alternative thrust restraints shall consider future maintenance requirements.

Thrust blocks and the zone of influence shall not protrude outside the easement or outside the space allocated in roadways. Concrete thrust/anchor blocks shall not obstruct the removal of bolts and nuts at flanged joints.

7.9.2.4 Timber and recycled plastics thrust blocks

Timber and recycled plastic thrust blocks are not permitted.

7.9.5 Restrained elastomeric seal joint water mains

Commercial restrained joint systems may only be used where there is limited space for the thrust block and prior Seqwater engineering approval is obtained.

7.10 Bulkheads and trenchstops

Bulkheads and trenchstops shall be designed in accordance with AS/NZS 2566.2 (Clauses 1.4.2 and 5.8, and Table 5.7).

When the grade is ⩾30%, the pipeline shall be fully welded.

Trench drainage shall not cause bolted fittings to become submerged for long periods of time. Trench drainage shall not affect land use of property owners.

8. Appurtenances

8.1 Valves – general

Unless otherwise approved by Seqwater all new valves equal to or greater than DN600 are to be installed in pits.

Valve pits shall comply with dimensions given in Seqwater Standard Drawing D-DWG-STD-00033. The design engineer is responsible for the structural design of the valve pit. In all cases a valve coupling is to be provided to allow later removal of the valve.

Pits that cannot be gravity drained within a reasonable distance, and considering constructability of the drain line, shall be provided with a sump pit for pumping equipment. A permanent removable grating to cover the sump pit shall not be provided instead the placement of a guard rail will be provided to control the safety hazard as detailed in Seqwater Standard Drawing D-DWG-STD-00034 Pit Sump Pump Details.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Pit cover slabs shall have an opening through the slab to allow sump pump removal without entering the pit.

Permanent sump pumps shall only be provided in pits with equipment needing protection against flooding. For some pits, level sensors may be required to avoid valves being submerged for excessive time.

Further guidance and requirements in relation to valves is provided in Seqwater Engineering Standard M-SPE-STD-003 Valves for Water Applications (SPE-00323).

8.2 Stop valves

8.2.1 Product specifications

Valves shall conform to Seqwaters Engineering Standard M-SPE-STD-003 Valves for Water Application (SPE-00323).

Unless otherwise approved by Seqwater engineer, valves shall be selected from Seqwaters pre-qualified equipment as listed in the Seqwater Engineering Standard X-LST-STD-001 Seqwater Preferred Equipment Register (REG-01074).

All valves shall be double flanged (in particular, wafer and lugged type valves shall not be used). Knife Gate valves shall not be used.

Valves with integral bypasses shall not be used without approval from Seqwater, as the failure of the bypass component generally necessitates replacement of the entire valve assembly resulting in significant cost and extended lead times particularly for large diameter valves. A valve with an integral bypass may be considered on a case-by-case basis, via a Deviation Request against this Standard, where it can be demonstrated that it is not practicable to install an external bypass (e.g. brownfield site with space limitations), is economically justified over the life of the valve, and there is no requirement to customise the sizing of the bypass valve.

8.2.2 Installation design and selection criteria

8.2.2.2 Gate valves

Gate valve installations shall comply with Seqwater Standard Drawings D-DWG-STD-031 Gate Valve Pit General Arrangement.

Gate valves, which are equal to or greater than DN600 or which require gearboxes, shall be installed in full size valve chambers. Under special circumstances (e.g. resilient seated valves) and when Seqwater approves, the valve chamber may only provide access to the gearbox.

Metal seated gate valves perform as physical plugs when entry into a water main is required.

Unless otherwise approved by Seqwater engineer, valves shall be selected from Seqwaters pre-qualified equipment as listed in the Seqwater Engineering Standard X-LST-STD-001 Seqwater Preferred Equipment Register (REG-01074).

8.2.2.3 Butterfly valves

Butterfly valve installations shall comply with Seqwater Standard Drawing D-DWG-STD-030 Butterfly Valve Pit General Arrangement.

Lever operated butterfly valves shall not be used for below ground installation.

Butterfly valves shall be double flanged type designed in accordance with AS 4795 and WSAA Product Specification WSA PS – 263 as per M-SPE-STD-003 Valves for Water Application (SPE-00323).

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Resilient seated butterfly valves shall be seal on disc for diameters ≥ DN600.

Butterfly valves for air valve isolation are not approved. Gates valves shall be used instead.

Unless otherwise approved by Seqwater engineer, valves shall be selected from Seqwaters pre-qualified equipment as listed in the Seqwater Engineering Standard X-LST-STD-001 Seqwater Preferred Equipment Register (REG-01074).

8.2.3 Stop valves for transfer/distribution mains

Maximum allowable spacing of isolation valves for transfer mains is 5km (as per WSA03-2011).

Isolation valves may be sized at 75% of pipeline diameter subject to pigging requirements and Seqwater engineering approval.

Locations must consider topography, accessibility, operational requirements, flooding, high risk areas and minimising water loss.

High risk areas include but are not limited to the following: Creek crossings, rail crossings, main road crossings, steep terrain, mine subsidence areas, sensitive environmental areas and locations where there is a higher risk of pipe failure e.g., acid sulphate soil areas.

Tapered connectors may be concentric or eccentric as appropriate and subject to Seqwater's engineering approval.

8.2.6 Bypass of stop valve

The bypass valve connections shall not be cast integral with the main stop valve.

DN225 bypass valves and pipework shall not be used.

By-passes complete with gate valve are to be provided around all main line valves greater than DN300.

8.2.7 Stop valves - location and arrangements

8.2.7.1 General

All valves shall be double flanged.

8.2.7.3 Arrangement 2

Where a stop valve is located on the opposite side of the road to the trunk main, the pipework between the trunk main and the valve shall be:

- Fully welded if the trunk main is fully welded
- Flanged if the trunk main is not fully welded

8.2.11 Stop Valves for Confined Space Isolation

Where Stop valves are to be used to isolate a main from a confined space prior to entry, consideration shall be given to providing double isolation by closure of two adjacent Stop valves based on an assessment of the risks being mitigated by the isolation prior to entry into the confined space. Further guidance is provided in Seqwater Engineering Standard M-SPE-STD-001 General Mechanical (SPE-00367).

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

8.4 Air valves (AV)

8.4.2 Installation design criteria

Air valve installations shall comply with Seqwater Standard Drawing D-DWG-STD-00006.

Valve pits shall comply with the following requirements:

- Be located below ground in pits with access covers.
- The design engineer shall be responsible for the structural design of the valve pit including thrust restraints if required.
- Located at all high points in the pipeline, at maximum distance of first air valve from drain down valve of 800 m, at a maximum spacing of 800 m, as close as possible to property boundaries or existing fence lines to avoid impacts on the landowner and the property.
- At 1.5 m maximum depth of valves to avoid complications for operational access.
- An isolation valve shall be provided adjacent to air valves to facilitate air valve maintenance. The isolating valve used with air valves shall be a double flanged gate valve and the same size as the air valve. The isolation valve must be operable from above ground.
- Concentric reducers at offset air valves are not permitted.
- Ventilation shall be provided to the pit via a vent pipe; alternatively, suitable ventilation must be provided within the access covers.
- Anti-slam air valves are required at the highest point on pipeline between section valves and at last AV to close in each section.
- Bi-bidirectional-flow pipelines require anti-slam valves on both sides of section valves (to be reviewed as part of transient analysis).
- Pressure test points are to be incorporated in all air valve assemblies to enable pressure test gauges to be connected manually for testing.
- Air valves on pipes DN750 and greater shall include a DN600 access branch also serving as an air collection chamber as detailed in Seqwater Standard Drawing No. D-DWG-STD-00006; and
- Air valves on pipes less than DN750 shall include a branch equal to the air valve size.

Air valves on above ground mains shall be provided with suitable access and platforms to enable personnel safe access for maintenance purposes.

8.4.4 Air valve size

On pipelines, the minimum air valve size shall be 100mm. Within pumping stations, DN50 and smaller air valves may be used. These smaller air valve installations shall include a stainless-steel ball valve as the isolator.

8.4.7 Use of hydrants as an alternative to air valves

For pipelines less than DN450, fire hydrants may be used in lieu of air valves with the engineering approval of Seqwater. These fire hydrants are for air control and are not to be marked as fire hydrants for firefighting purposes. The fire hydrants will have a DN100 flange.

8.5 Non-return valves

Generally swing check valves with external lever arms and adjustable counterweights suitable for dampener installation with micro switch position indicators are preferred. All external moving parts are to be covered with a suitable removable guard.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

8.6 Scours and pump-out branches

8.6.1 Location and arrangements

Scour valve installations shall comply with Seqwater Standard drawing D-DWG-STD-00005.

8.6.2 Design

Scour/Drain down arrangements may include an orifice plate to limit velocities through valves.

In addition to items (a) to (d) listed in the WSAA Code, scours shall also:

e) Not be subject to inundation from a flood due to a storm event of a frequency of 1 in 2 year recurrence.

f) Be located such that it is not submerged for an extended period of time.

g) Not be located at the lowest point when inundation, access or submersion is a problem. Under these circumstances, it is acceptable for the retained water to be removed by pumping, subject to Seqwater approval; and

h) Take into consideration the surroundings in which it discharges and the need of any drainage easements.

8.6.4 Scours size

Unless approved by Seqwater, all scour valves are to be the same size for a given pipeline.

DN225 shall not be used.

8.6.5 Scour location

Locations need to consider topography, accessibility, operational requirements, flooding and suitability of environment for discharge. Unless approved otherwise, scours shall not discharge to closed storm water systems such as at maintenance holes.

Emptying of the drain down collection manhole by pumping is acceptable in areas where it is impractical to locate the manhole in an area where it is self-draining.

8.7 Swabbing points

Swabbing/pigging installations shall comply with Seqwater Standard drawing D-DWG-STD-00032.

Swabbing/pigging points shall be provided on all mains DN 900 and larger unless otherwise directed by Seqwater.

Swabbing/pigging installations shall also:

a. Be located at 10 km maximum spacing between pigging stations, unless otherwise approved by Seqwater.

b. Permanent launching and retrieval pigging stations with valving may be considered rather than ‘drop out’ pipe section facilities.

8.8 Hydrants

Hydrants shall not be used unless approved by Seqwater.

8.9 Disinfection facilities

Facilities in this clause refer to the pipe fittings required to facilitate disinfection of new mains.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

8.10 Surface fittings

8.10.2 General

The design of surface fittings shall take into account safe access for the operation of the fittings.

8.11 Appurtenance location marking

8.11.2 Marker Posts and Plates

Marker posts and identification plates shall also be provided as shown on Standard Drawings D-DWG-STD-00003 and D-DWG-STD-00004.

In addition appurtenances shall be provided with Equipment Numbers and Operating Asset Labels in accordance with Seqwater Procedure X-PRO-STD-006 Asset and Equipment Identifier (PRO-02190).

8.12 Flowmeters

Flowmeters shall not be buried. Flowmeters shall be installed in pits.

Flowmeters shall comply with Seqwater Standard M-SPE-STD-006 Bulk Water Meters for Potable Water (SPE-00322). This document is published on the Seqwater Internet Site as required by the Bulk Water Supply Code (Qld) of 1 January 2013 made by the Minister under Section 360M of the Water Act (Qld) 2000.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

9 Design review and drawings

9.2 Design drawings

9.2.1 General

Additional information is provided in the following document.

- X-PRO-STD-007 Drawing & Spatial Data Standards (PRO-02187).

9.2.3 Scale

Additional information is provided in the following document.

- X-PRO-STD-007 Drawing & Spatial Data Standards (PRO-02187).

9.2.4 Content of drawings

Additional information is provided in the following document.

- X-PRO-STD-007 Drawing & Spatial Data Standards (PRO-02187).

9.4 Recording of 'work as constructed' information

The design drawings shall be prepared so that the 'As Constructed' information can be submitted in the format described in Clause 24 of Part 2: Construction.

Notes

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Part 2: Construction

11. General Construction

11.1 General

In addition to the requirements in this Standard, construction of infrastructure projects being delivered by Seqwater and their contractors and suppliers shall be delivered in accordance with the Seqwater Engineering Standard X-MAN-STD-001 Engineering Management Manual (MAN-00383).

The Constructor shall refer to specific project contract documents for construction requirements on each asset creation or modification project.

The project contract documents shall be provided to Seqwater for review and approval before their implementation.

Construction of Seqwater assets shall comply with all relevant Australian Standards, local, state and federal by-laws, building approvals and current legislation requirements. Construction requirements shall include but necessarily be limited to the following requirements:

- Safety in Design including protection of people, services, property and the surrounding environment and heritage areas.
- Community and stakeholder consultation.
- Seqwater Planning and Design requirements.
- Delivery of all materials including pipes, mechanical couplings, fittings and valves.
- Visual inspection of all line pipes, mechanical couplings, fittings and valves from the suppliers and report defects before installation.
- Laying and jointing of pipes including rubber ring, flanged and welded mild steel joints.
- Repair of pipe coatings.
- Supply and application of field coatings to mild steel pipes and flanged joints.
- Supply and installation of all concrete thrust blocks, bulk heads, pipe supports, pipe welding, etc. required for the anchoring of line pipes and fittings as nominated on the drawings.
- Location, exposure and protection of all existing services and public utilities along the pipeline.
- Route impacted or potentially impacted by construction.
- Coordination of all necessary interfaces with external service authorities or affected asset owners.
- All dewatering and groundwater disposal in accordance with the Environmental Management.
- Plan and Environmental Work Method Statements developed.
- All activities relating to spoil handling and disposal in accordance with the Environmental.
- Management Plan and Environmental Work Method Statements.
- All activities related to the filling, disinfection, flushing, testing and commissioning of the pipeline.
- All activities related to the reinstatement of works areas such as roads, landscaping, temporary and permanent protection structures, etc.

11.5 Protection of Property and Environment

11.5.2 Disused / Redundant Water Mains

All fittings, walls, etc. related to the pipeline need to be removed entirely or removed to a depth of at least 600mm.

12 Products and materials

12.1 Authorised products and materials

12.1.1 General

All pipe materials and fittings shall be approved by Seqwater. All materials and fittings shall be installed to the manufacturer's specifications.

Table 12.1 12.1 provides general information on pipeline options approved by Seqwater.

Table 12.1:- Principal pipeline systems

Description		Requirement
DI (Ductile Iron)	Cement mortar lined with approved seal coating	Pipe Class PN35 Fittings can be Class 16 For coating requirements refer Section 4.3 herein.
	Polymer lined	
MS (Mild Steel)	Cement mortar lined with approved seal coating	Wall thicknesses and outside diameter need to be confirmed with Seqwater
	PE coated and lined	
GRP (Glass Reinforced Plastic)	GRP pipes and fittings shall not be used	
PE (Polyethylene) and PVC (Poly Vinyl Chloride)	Seqwater does not keep spare parts for PVC as it is not a reticulation Water Agency. Therefore PVC shall not be used for pressure pipe applications. Due to a history of premature failures PE Pipe shall not be used for pressure pipe applications where there is a viable alternative material available for the application. Use of PE for pressure pipe applications will only be accepted when approved by Seqwater via the Deviation Request process and in consideration of the requirements as outlined in Section 4.5 of this Standard.	
Hot dipped galvanised bolts, nuts and washers	Accepted for use within concrete valve chambers or above ground locations	

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

15. Pipe Laying, Jointing and Connecting

15.2 Horizontal and vertical deflections of pipes

15.2.3 Curving of pipe

Curving of PVC pipe without bends is not permitted. Curving of PE pipes including limiting the radius of curvature shall be in accordance with PIPA Guideline POP202.

24. Works as constructed details

Additional requirements are provided in the following document:

- X-PRO-STD-007 Drawing & Spatial Data Standards (PRO-02187).

25 Standard drawings

Seqwater Standard Drawings are available for some pipeline activities. These are General Arrangement drawings only showing acceptable arrangements and/or Seqwater minimum requirements and still require engineering design to make them suitable for construction purposes.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Appendices

Appendix A – Generic Infrastructure Protection Guidance

Accepted by Seqwater, however, please read this Appendix in conjunction with GDE-00348 "Seqwater Network Consent Guidelines" and the Standard SPE-00442 "Seqwater Baseline Security Measures"

Appendix B – Equivalent Pipe Sizes for Commonly Used Materials

Accepted by Seqwater. However please refer to Part 3.1.3 of this Publication. Seqwater does not accept the use of DN225 mm pipe without an approved Seqwater Engineering Standard Deviation.

Appendix C – Under Pressure Cut-in Connection to Pressure Pipes ⩾ DN 80

Not accepted by Seqwater. Under-pressure Cut-In Connections will only be conducted in Seqwater pipelines after an approved Seqwater Engineering Standard Deviation Request. This Deviation Request will only be accepted after provision of a satisfactorily certified (RPEQ) report demonstrating that the process does not decrease the operational life of the pipeline as defined within the relevant Seqwater Asset Class Plan.

Appendix D – Booster Configuration

Accepted by Seqwater.

Appendix E – Selection of Pressure Accumulation Tanks

Accepted by Seqwater.

Appendix F - Guidelines for Water Mains in Slip and Potentially Unstable Areas

Accepted by Seqwater; however, Parts F2.2 and F4.2 are not applicable to Seqwater.

Appendix H – Hydrant Spacings

Not applicable to new Seqwater Pipelines. Application in existing pipelines must obtain prior approval via an Engineering Standard Deviation Request to the Engineering Standards and Assurance Unit.

Appendix I – Disinfection of Water Mains and Water Quality Compliance Specification

Accepted by Seqwater; however, all Seqwater works must also comply with Seqwater Requirements for Disinfection, including:

- Procedure PRO-01554 "Disinfection of Water Mains".
- Procedure PRO-01559 "Disinfection of Bulk Water Supply Reservoirs".
- Procedure PRO-01560 "Tools and Equipment Disinfection".
- Procedure PRO-01869 "Disinfection of Pumps, Hoses, Vac Trucks, ad Jet Rodding Equipment".

Appendix J – Safety Assurance Plan and Job Safety Analysis

Accepted by Seqwater; however, Seqwater Procedure PRO-00808 "Contractor Management Procedure (HWS, Env & DWQ)" must also be complied with for Seqwater Infrastructure works.

Appendix K – Connectivity Inspection of Dual Water Supply Systems

Accepted by Seqwater for Information. Any proposed Dual Water Supply Systems must be designed and constructed in liaison with Seqwater Engineering Standards and Assurance Unit engineers.

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.