

# Engineering Standard

## D-SPE-STD-001

### Water Supply Network Planning, Design and Construction

**(Seqwater Supplementary Manual to the WSA Water Supply Code of Australia: WSA03-2011 Version 3.2)**

Document Number: SPE-00395

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		Position	Signature	Position	Signature	Date
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This Engineering Standard was endorsed by SME Naurelle Black, RPEQ Registration No.25801 on 16/09/2022 on behalf of Seqwater.

## Version History

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2	27/07/2021	Amended Version	Civil and Pipeline Engineer, Naurelle Black	Lead Civil Engineer, Errol George	Principal ESA, Geoff Simmers	Manager TSI, Matt McCahon
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### Preface

This document was originally published on 13 May 2011 by The Queensland Bulk Water Transport Authority (trading as Linkwater) as “Supplementary Manual to WSA 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 was subsequently published on 18 June 2018 as a 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 2 onwards the main title has been updated to “Water Supply Network Planning, Design and Construction” to better reflect the subject matter of the document, with a subtitle reflecting the title of revision 1).

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**Note: Parts 1 and 2 Contain separate Tables of Contents for which the clause and section numbers match those that are used in the WSAA Water Supply Code of Australia (WSA 03-2011 V3.2)**

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# Introduction

## 0.1 Purpose

This Engineering Standard describes Seqwater’s specific requirements for planning, design and construction of water supply networks that vary from, or are in addition to, those detailed in the *Water Supply Code of Australia WSA 03-2011, Version 3.2* (“WSAA Code”) published by the Water Services Association of Australia (WSAA). This document must be used in conjunction with the documents it references 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 Application

This Engineering Standard applies to all Seqwater employees, suppliers, contractors 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 also applies where relevant to external parties undertaking works in the vicinity of Seqwater network assets that have the potential to interfere with or impact those assets and are therefore subject to Seqwater’s written Consent, as required under Section 192 of the Water Supply (Safety and Reliability) Act 2008.

Seqwater encourages employment of any innovation that offers enhanced functionality and reduce lifecycle cost, however Seqwater’s approval as a Deviation from this Engineering Standard shall be sought before any innovative system is installed.

Deviation from the requirements in this Engineering Standard requires written agreement from Seqwater as per the Deviation process detailed in Seqwater Standard Procedure *X-PRO-STD-008 Asset Standards Management and Application*. This process includes completion of an *Asset Standards Deviation Request Form X-TMP-STD-022* and submission to Seqwater Engineering via the Seqwater Project Representative (e.g., Seqwater Project Manager or Seqwater Consents team) for external parties, or via Seqwater’s Engineering Mailbox ([engineering@seqwater.com.au](mailto:engineering@seqwater.com.au)) for internal parties.

Where a Deviation from this Engineering Standard is requested, including for an innovation, alternative product or alternative solution, the requestor will need to demonstrate that such innovation, product or solution complies with applicable industry standards, relevant specifications and is equivalent to, or better than, the requirement referred to herein. This shall include an analysis of benefits, lifecycle costs, and risks to health and safety, environment, security of water supply, and water quality of the proposed innovation, product or solution compared to the requirement in the Engineering Standard, certified by a Registered Professional Engineer of Queensland in a suitable discipline.

Responsibility for ensuring compliance with Seqwater Engineering Standards lies with those engaged in the management and execution of design, construction, and maintenance activities on, or impacting, Seqwater assets. This Engineering Standard must be used in conjunction with other relevant Asset Standards and project specific documents to define the technical requirements for asset design and construction.

At all times the Contractor maintains responsibility for a fit for purpose design and compliance with all relevant Australian legislation, Standards, Codes and Guidelines (including those produced by WSAA). Where no Australian Standard exists for a particular application, work must conform to the most current version of an industry accepted international standard.

In the case that it is identified that a specific requirement within this Engineering Standard does not meet the requirements of project specific documents, another Seqwater Asset Standard or Australian

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legislation, Standards, Codes or Guidelines, the conflict must be brought to the attention of the Seqwater Principal, Engineering Standards and Assurance (or their delegate), and written agreement must be gained prior to application of the requirement.

Advice must be sought from Seqwater to clarify any ambiguities regarding this Engineering Standard.

Seqwater undertakes regular updates of Asset Standards. Before utilising this Engineering Standard, the complete list of Seqwater Asset Standards should be reviewed, to ensure currency and applicability of standards applied to the works.

## 0.3 Definitions and Abbreviations

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

## 0.4 Operation

Sections are provided in this Engineering Standard corresponding to each Part of the WSAA Code (Parts 1 and 2). 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.

A copy of the *WSAA Water Supply Code of Australia (WSA 03-2011, Version 3.2)* is available from the Water Services Association of Australia via [www.wsaa.asn.au](http://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 those in the WSAA Code. The clause numbering of this Engineering Standard matches the WSAA Code.

It is recommended that this document is also 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. These Consent Guidelines assist in providing the background of many Seqwater engineering requirements.

## 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 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 relevant Seqwater engineering endorsement for any deviations as outlined in under the “Application” section above.

## 0.6 Reference Documents

The documents listed in Table 0-1 and Table 0-2 below and the requirements therein, are relevant to this Engineering Standard. In their latest editions, these documents form a part of this Engineering

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Standard unless amended by this Engineering Standard. Note that this is not an exhaustive list of documents relevant to the works.

**Table 0-1 – Reference Seqwater Documentation**

Engineering Document Number	Document Title	Controlled Document Ref.
D-GDE-STD-001	Seqwater Network Consent Guidelines	<a href="#">GDE-00348</a>
X-PRO-STD-009	Engineering Design, Review and Approval Procedure	<a href="#">PRO-01617</a>
X-PRO-STD-002	Engineering Drawing Number Procedure	<a href="#">PRO-01872</a>
X-PRO-STD-001	Asset Standards Document Classification and Naming Structure Procedure	<a href="#">PRO-01873</a>
X-PRO-STD-004	Development and Review of Asset Standards Procedure	<a href="#">PRO-01874</a>
X-PRO-STD-007	Drawing & Spatial Data Standards Procedure	<a href="#">PRO-02187</a>
X-PRO-STD-006	Equipment Numbering and Naming Convention Procedure	<a href="#">PRO-02190</a>
X-PRO-STD-008	Asset Standards Management & Application Procedure	<a href="#">PRO-02205</a>
M-SPE-STD-006	Bulk Water Meters for Potable Water	<a href="#">SPE-00322</a>
E-SPE-STD-001	Electrical Design and Construction	<a href="#">SPE-00352</a>
E-SPE-STD-002	Instrumentation	<a href="#">SPE-00353</a>
I-SPE-STD-013	Control Systems Design and Construction	<a href="#">SPE-00361</a>
M-SPE-STD-001	General Mechanical	<a href="#">SPE-00367</a>
S-SPE-STD-001	Reservoir – Metal Roof	<a href="#">SPE-00370</a>
X-TMP-STD-022	Asset Standards Deviation Request Form	<a href="#">TEM-00224</a>

**Table 0-2– Reference External Standards, Legislation, Specifications and Codes**

Standard / Reference	Document Title
WSA 03-2011	Water Supply Code of Australia, Third Edition, Version 3.2 (Water Services Association of Australia, 2011 – update 1/2022)
Queensland Legislation	Water Act (Queensland) 2000
DNRME	Bulk Water Supply Code
AS2566.2	Buried Flexible Pipelines - Installation
AS5334	Climate change adaption for settlements and infrastructure – a risk based approach

## 0.7 Disclaimer

Seqwater exclude all liability to all persons and to all conditions and warranties, which are expressed or implied at law (including under statute). Where liability and conditions and warranties cannot be excluded at law, the liability of Seqwater is limited at their choice, to resupplying the Engineering Standard (this document) or paying the cost of resupplying the Engineering Standard.

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

Seqwater will not be liable for any loss or damage that may occur as result of the use of the information contained herein.

## 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.

Section Number	Change
General	Updated references to WSA03-2011 version 3.1 to the latest Version 3.2 released in January 2022.

## 0.9 Verification

Compliance with this document may be verified by internal audit.

## 0.10 Further Information

For further information please contact the owner of this document.

### NOTES

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# Part 1: Planning and Design

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## 1 GENERAL

### 1.2.2 Scope and Requirements

Contingency plans developed in relation to “(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 as a guidance only to show minimum Seqwater requirements. They 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

The Designer shall provide the Operational Philosophy and a Functional Design Specification.

Designers shall ensure the following additional aspects have been considered and where appropriate included in the design:

- o) The infrastructure of other Utilities, or Agencies, which may be affected by the proposed work, are clearly marked on the design drawings;
- p) 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;
- q) All work associated with the potholing and survey of services shall be carried out to the satisfaction of the appropriate authority; and
- r) Fibre optic cabling, and cathodic protection infrastructure, installed parallel with pipeline (if required by Seqwater).

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

#### 1.2.5.3 Design Outputs

Design output shall also include:

- e) Details construction drawings including the location of all existing services;
- f) Design drawings showing, as appropriate, location of pump stations, reservoirs and buildings, materials used and size;
- g) Detailed drawings and specifications including structural, electrical, mechanical, civil and hydraulic design;
- h) Inspection and test plan;
- i) Acquisition plans detailing any additional land and/or easement requirements that may be associated with the proposed works;
- j) Operation and Maintenance Manuals; and
- k) Safety in Design Report detailing Safety in Design activities undertaken during the design process and any residual risks Seqwater would be required to accept.

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### 1.2.6 Design life

Unless agreed otherwise Asset design lives shall be in accordance with Table 1.2 as modified herein.

**TABLE 1.2 TYPICAL DESIGN LIVES**

Infrastructure Asset Type	Minimum design life (years)
Water mains (including all appurtenances)	100
Facilities (e.g., Reservoirs, Pump stations, amenities buildings, offtakes, section valve pits, pigging pits)	80
Platforms, walkways, stairways and ladders (Metallic / FRP)	50 / 20
Mechanical equipment (e.g., Pumps, motors, valve actuators, pressure vessels, compressors)	25
Electrical equipment	20
Instrumentation (e.g., SCADA, Control Systems)	15

### 1.2.7 Instrumentation and control systems

All designs incorporating monitoring and control equipment shall comply with Seqwater’s Engineering Standards *E-SPE-STD-002 Instrumentation* and *I-SPE-STD-013 Control Systems Design and Construction*.

## 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 consumers, the maximum allowable operating pressures are set by the Local Water Authority.

### 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 to Non-drinking water pipes

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

### 2.8 PUMPING STATIONS

#### 2.8.2.2 *Site related factors*

Site factors to be considered when locating pump/s shall also include:

- f) Ensure all structures are constructed with a level of flood immunity equivalent to a Q200 flood event;
- g) Drainage at the site;
- h) Ensure access to critical electrical gear during flood events is provided at all times;
- i) Attention to Seqwater requirements for SCADA connections;
- j) Obtain approval from the Local Authority for any buildings to be located on the flood plain;
- k) Filling of the flood plain shall not be considered or permitted without the specific and written approval of the Local Authority; and
- l) Line of sight from electrical pump connection.

#### 2.8.2.3 *Service related factors*

Service factors to be considered in the design of a pumping station shall also include:

- i) Access to electrical cabling and communication cabling;
- j) Site access to the pumping station site for light and heavy vehicles; and
- k) Security fencing.

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## 2.10 TRENCHLESS TECHNIQUES FOR PIPELAYING

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

- a) passing through:
  - (iv) areas of cultural heritage significance; and
  - (v) temporary works outside easement, or
  - (vi) allocated, 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 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 level of flood immunity equivalent to a Q200 flood event;
- e) Ensure access to critical electrical infrastructure during flood events is provided at all times;
- f) Obtain approval from the relevant Local Authority for any buildings to be located on the flood plain; and
- g) Filling of the flood plain shall not be considered or permitted without the specific and written approval of the relevant Local Authority.

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### 3 HYDRAULIC DESIGN

#### 3.1.3 Empirical sizing of reticulation mains

Water main size of 225mm diameter is not accepted for Seqwater infrastructure.

### 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 35 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

### 4.6 STEEL PIPELINE SYSTEMS

#### 4.6.3 Joints

Internal joint reinstatement is to be undertaken for all joints in pipes larger than DN600.

Deflections at weld collars shall not exceed  $\frac{1}{2}^\circ$  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-009* and *E-DWG-STD-001* 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.

#### 4.8.8 Bolted Connections

Bolted connections shall comply with Standard Drawing *D-DWG-STD-009*.

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## 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 shall be coincident with Air valves tees where practicable.

Buried access facilities are not acceptable.

### 5.4 LOCATION OF WATER MAINS

#### 5.4.2.1 *General*

Due to their size; water mains must be laid in the road shoulder or under road pavements in the kerb side lane of the carriageway. When the Trunk Water Main is located in the road reserve, written approval of the alignment and level of the main shall be obtained from the road owner.

Water mains shall not be laid under a footpath, bikeway or roadway constructed of concrete, unless the water main is concrete encased to Seqwater's engineering satisfaction. 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 now laid in a carriageway, the water main shall be relocated or concrete encased.

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.

#### 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

#### 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.

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Easements shall be a minimum of 15 metres wide; and at least equivalent to the width of a surrendered Seqwater Easement.

If a water main cannot be placed in a road reserve, an easement will be required. When an easement is required, consideration shall be given to long term access arrangements for operational and maintenance reasons.

If scour valves are located in an easement, then consideration needs to 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 asset in an easement, shall arrange for the provision of that easement and registration of such easement.

## **5.4.9 Crossings**

### **5.4.9.1 General**

The design of water main crossings of controlled access roads (e.g., 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 7.6.1)

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 7.6.1

## **5.4.10 Railway reserves**

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. 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 envelope 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 water main is located within a power easement, 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 in Part 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.

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#### 5.4.15 Location Markers

Marker posts with location markers to be located as per the requirements of Seqwater Standard Drawings *D-DWG-STD-003* and *D-DWG-STD-004*.

#### 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 Standard Seqwater Drawing *D-DWG-STD-001*.

#### 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.

Standard offtake design shall include 2 isolation valves directly off the Seqwater water main line tee, with DN300 riser pipe and ball valves for de-pressurisation of pipe section between valves. This shall be:

5.9.1 Followed by a flowmeter installed in a pit.

5.9.2 Then followed by 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 pressure class of receiving main. Pressure transducers shall be located at all offtakes.

#### 5.11 PROPERTY SERVICES

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

#### 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 accurately located by approved non-destructive methods such as hydro-vacuum potholing systems.

###### 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).

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**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 <sup>1</sup> (mm)	
	≤ DN200	> DN200 and < DN600	≥ DN600	< DN375	≥ DN375
Water mains ≤DN375 <sup>2</sup>	300 <sup>3</sup>	600	1000	150	300
Water mains >DN375 <sup>2</sup>	600	1000	2000	300	500
Gas mains - Low pressure	300 <sup>3</sup>	600	1000	300	500
Gas mains - High pressure	5000	5000	5000	300	500
Telecommunication conduits and cables	300 <sup>3</sup>	600	600	150	150
Electrical conduits and cables	500	1000	1000	300	500 <sup>7</sup>
Electrical and communication poles	600	600	2000	N/A	N/A
Drains <DN300	300 <sup>3</sup>	600	1000	150 <sup>4,8</sup>	150
Drains ≥DN300	300 <sup>3</sup>	600	2000	150 <sup>4,8</sup>	500 <sup>4,8</sup>
Sewers <DN200 <sup>4,8,9</sup>	1000/600	1000/600	1000	500	500
Sewers ≥DN200 <sup>4,8,9</sup>	1000/600	1000/600	1000	500	500
Kerbs	150	600 <sup>6</sup>	600	900	900

**Notes:**

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-001* (encasement to extend 2 m on both sides of the utility service crossing)
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 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-009*.

### 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).

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.

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## 7.5 GEOTECHNICAL CONSIDERATIONS

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 as per the Seqwater Standard drawings *D-DWG-STD-001 and 002* are as follows:

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

### 7.6.1 General

Concrete encasement shall be as per the requirements of Standard Drawing *D-DWG-STD-001* Type 4 trench detail or Standard Drawing *D-DWG-STD-002* Type 8 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 property boundaries.

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

Where concrete encasement is required by Seqwater for crossings of new services; 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 the 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 joints compliant with the requirements of Standard Drawing *D-DWG-STD-001* will be accepted.

Rocker pipes (maximum 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.

### 7.6.3.2 Existing steel pipelines

For major roadways and railways, mechanical protection shall extend 2000mm beyond the property boundaries.

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

## 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.

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## 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 m<sup>3</sup>, an alternative thrust restraint shall be investigated. All alternative thrust restraints shall take into account 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 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  $\geq 30\%$ , 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 greater than DN600 are to be installed in pits. Valve pits shall comply with dimensions given in Seqwater Standard drawing S-DWG-STD-005. 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 sump pit shall not be provided instead the placement of a guard rail will be provided to control the safety hazard.

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.

### 8.2 STOP VALVES

#### 8.2.1 Product Specification

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.

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## 8.2.2 Installation design and selection criteria

### 8.2.2.2 Gate Valves

Gate valves, which are 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.

### 8.2.2.3 Butterfly Valves

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. PN25 and above pressure rating butterfly valves shall be seal on disc type. PN21 and lower pressure class shall be seal on body type.

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

## 8.2.3 Stop valves for transfer/distribution mains

Double isolation by closure of two isolation valves at adjacent sites must be provided before confined space entry is considered.

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.

For transfer mains greater than DN900, the maximum spacing may be increased to 10km if:

- There is no more than one offtake between valves
- No high-risk areas exist between valve locations

## 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

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## 8.4 AIR VALVES (AV)

### 8.4.2 Installation design criteria

Air valve installations shall comply with Seqwater Standard Drawing *D-DWG-STD-001*.

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-001; and
- Air valves on pipes less than DN750 shall include a branch equal to the air valve size.

#### 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.

#### 8.4.6 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.

## 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-005*.

### 8.6.2 Design

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

Scours shall also:

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- c) not be subject to inundation from a flood due to a storm event of a frequency of 1 in 2 year recurrence;
- e) be located such that it is not submerged for an extended period of time;
- f) 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
- g) 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 *S-DWG-STD-004*.

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 attachments for disinfection of new mains.

### 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

Marker posts and identification plates shall be provided as shown on drawings *D-DWG-STD-003* and *D-DWG-STD-004*.

### 8.12 FLOWMETERS

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

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Flowmeters shall comply with Seqwater Standard *M-SPE-STD-006 Bulk Water Meters for Potable Water*. This 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*.

## 9.2 DESIGN DRAWINGS

### 9.2.1 General

Additional information is provided in the following document

- *X-PRO-STD-007 Drawing & Spatial Data Standards*

### 9.2.3 Scale

Additional information is provided in the following document

- *X-PRO-STD-007 Drawing & Spatial Data Standards*

### 9.2.4 Content of drawings

Additional information is provided in the following document

- *X-PRO-STD-007 Drawing & Spatial Data Standards*

## 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

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## Part 2: Construction

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## 10 GENERAL

### 10.1 SCOPE

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.

#### 11.5.2 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.

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## 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 provides general information on pipeline options approved by Seqwater.

**TABLE 12.1 PRINCIPAL PIPELINE SYSTEMS**

Description		Requirement
DI	Cement mortar lined with approved seal coating	Pipe Class PN35 Fittings can be Class 16
	Polymer lined	
Steel	Cement mortar lined with approved seal coating	Wall thicknesses and outside diameter need to be confirmed with Seqwater
	PE coated and lined	
GRP		GRP pipes and fittings shall not be used
PE and PVC		Seqwater does not keep spare parts for PE or PVC as it is not a reticulation Water Agency. Therefore, the use of PE and PVC is limited for pressure pipe.
Hot dipped galvanised bolts, nuts and washers		Accepted for use within concrete valve chambers or above ground locations

### 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.

## 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.

## Appendices

### Appendix A – Generic Infrastructure Protection Guidance.

Accepted by Seqwater, however, please read this Appendix in conjunction with 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 DN225mm pipe without an approved Seqwater Engineering Standard Deviation.

### Appendix C – Under Pressure Cut-in Connection to Pressure Pipes $\geq$ 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](#) “HWS & Environmental Contractor Management” 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.

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