STD-SPE-C-004

TECHNICAL SPECIFICATION

SURVEY AND TOLERANCING REQUIREMENTS

May 2025

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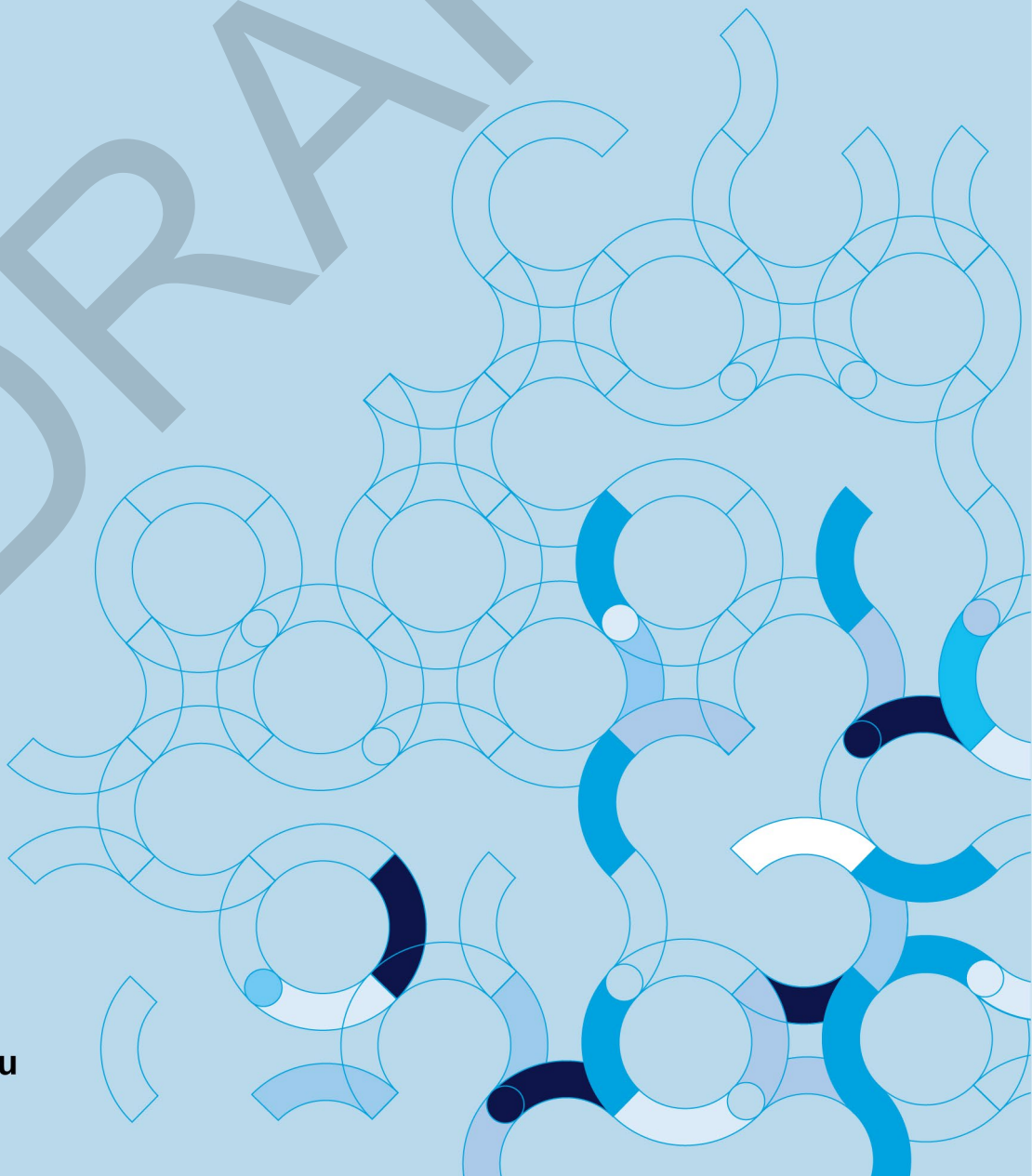

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Document management

Document authorisation table

Issue	Date	Author	Reviewer	Approver
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Version control table

Issue	Date	Reason for issue
1	02/07/18	Issued for mandatory use
2	TBC	Review of content and update to comply with ACT Professional Engineers Registration scheme. Revised for GDA2020 MGA2020 zone 55 implementation.

Document applicability table

Asset area	Applicable (Yes/No)	Asset area	Applicable (Yes/No)
Dams (DAM)	**Yes**	Water Network (WAT)	**Yes**
Bulk Water Supply (BWS)	**Yes**	Sewerage Network (SEW)	**Yes**
Water Treatment Plants (WTP)	**Yes**	Sewage Pump Stations (SPS)	**Yes**
Water Pump Stations (WPS)	**Yes**	Sewage Treatment Plants (STP)	**Yes**
Reservoirs (RES)	**Yes**	Recycled Water Systems (REC)	**Yes**

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Contents

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Abbreviations

Acronym	Full form
ACT	Australian Capital Territory
AGD66	Australian Geodetic Datum, 1966 (Stromlo / Stromlo Grid)
AHD	Australian Height Datum
AS	Australian Standards
BYDA	Before You Dig Australia
CL	Centreline
CV	Curriculum Vitae
DICL	Ductile Iron Cement Lined
DN	"Diameter Nominal" (Nominal Pipe Size)
GDA2020	Geocentric Datum of Australia 2020
GDA94	Geocentric Datum of Australia 1994
GRP	Glass Reinforced Plastic
HDPE	High-density polyethylene
IL	Invert Level
IPaD	Investment Planning and Delivery
ITP	Inspection and Test Plan
LMWQCC	Lower Molonglo Water Quality Control Centre
MGA	Map Grid of Australia (based on GDA94)
MGA2020	Map Grid of Australia 2020 (based on GDA2020)
MH	Maintenance Hole
ML	A now defunct level referencing system. Refer to the definition over-the-page.
mm	Millimetres
MS	Microsoft
NSW	New South Wales
PN	Pressure Nominal
PVC	Polyvinyl Chloride
QL	Quality Level

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Acronym	Full form
RL	Reduced Level
RPZD	Reduced Pressure Zone Device
SCL	Steel Cement Lined
SN	Stiffness
SUI	Subsurface Utility Information
SWMS	Safe Work Method Statement
TCCS	Transport Canberra and City Services
WAE	Work as Executed
WSA, WSAA	Water Services Association of Australia

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Definitions

Keyword	Definition
Acceptance	Written acceptance by the Owner that the entire work and all Contract requirements have been completed in accordance with the Contract Documents, as evidenced by the Owner's recordation of a Notice of Completion.
Approval	Does not imply acceptance of responsibility by Icon Water for compliance with this technical specification. Unless approval has been issued in writing, approval has not been granted.
Buried service	For the purpose of this specification, buried services shall be taken to have the same meaning as buried utilities. Refer to "buried utility" for a definition.
Buried utility	Shall have the same meaning as "Utility" as defined in AS 5488.
Contract	The Contract Documents which form the Contract for Construction.
Contract Documents	Complete documentation for a Contract, part of which comprises this standard specification.
Contract Drawings	Drawings that form part of the Contract Documents.
Contractor	The person or organisation responsible for construction of the works including testing, commissioning and handover.
Defective Work	Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; or work that has been damaged prior to the final acceptance by the Principal Contractor.
Designer	The individual person or organisation responsible for design of the works. The Designer may be Icon Water personnel or an external engineering consultant, a vendor/supplier or an installation Contractor.
Developer	As per the definition provided in *STD-SPE-G-019 Asset Creation and Approval.*
Drawings	The drawings, plans, elevations, sections, details, schedules, maps, profiles, diagrams, and other graphic and pictorial representations which indicate the design, character, location, nature, extent, and scope of the Work and which have been prepared by the Designer, approved by the Contractor and Owner and are included and/or referred to in the Contract Documents. Shop Drawings are not Drawings or Contract Documents, as so defined.
GDA2020 / MGA zone 55	As per EPSG:7855 and the intergovernmental Committee on Surveying and Mapping Geodesy Working Group.
Hold point	A milestone when acceptance is required from Icon Water, prior to commencing the subsequent construction activity. Acceptance from Icon Water must be obtained by providing all necessary documentation as required by Icon Water specification. Hold Points shall apply prior to commencement of designated work lots or work items. Hold points have been identified in Icon Water Standard specifications as a **guide** and shall be established within the boundaries of the contractor scope and context.
Icon Water	The owner and operator of the constructed works.

DRAFT

Keyword	Definition
Icon Water Representative	The nominated person or organisation that has written authority to act on Icon Water's behalf. This may be an Icon Water employee (or employees) such as an Icon Water Inspector or Icon Water Site Surveillance Officer, or a third party engaged to act on Icon Water's behalf.
Icon Water Standard Drawings	Standard Drawings of Icon Water or adopted by Icon Water including but not limited to those produced by the Water Services Association of Australia.
Include	Means including but not limited to and is used to provide clarification or examples of the type and nature of items intended.
Operator	The Operator is defined as Icon Water. The term may be also referred to herein as Icon Water Operations.
Owner	The Owner is defined as Icon Water.
Principal	Shall be as defined in project specific contract documentation. For assets "gifted" to Icon Water, the Principal may be the Developer. Otherwise, for assets which are not "gifted", Icon Water or its alliance partner (if applicable) will be the Principal.
IPaD	Icon Water's internal process and procedures for investment planning and delivery (i.e. capital expenditure).
ML	Refers to the original construction level datum/system used at Icon Water's LMWQCC in the early 1970s. These levels are based on the now defunct "Canberra Precise Datum" and were determined by converting the Canberra Precise Datum levels (expressed in imperial units) to metric units. To convert between ML and RL values: *RL = ML – 0.326 metres*
Qualified Surveyor	A person who meets or exceeds the qualifications and practical experience criteria detailed in Section 2.3 of this specification.
Quality Level	As per the definition provided in AS 5488-2022-1.
Registered Engineer	According to the Professional Engineers Act 2023, a professional engineer is an individual registered under the Act to carry out professional engineering services in one or more areas of engineering including civil, electrical, fire safety, mechanical, and structural. Registered engineers in the ACT are registered with the Professional Engineers Registrar, which is part of the ACT government. This Registrar manages the registration process, including assessing applications, maintaining the register of professional engineers, and ensuring compliance with the Act.
Shall / Must	Indicates that a statement is mandatory.
Should	Indicates a recommendation.
Shop Drawings	All drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for the Contractor to illustrate some portion of Work.
Specifications	Technical specifications of the Contract Documents consisting of written technical requirements for materials, equipment, products, systems, standards and quality of work for execution of the Work.
Subcontractors	An individual, partnership, corporation, joint-venture, or other legal entity having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

DRAFT

Keyword	Definition
Superintendent	The individual appointed by either the Developer (in the case of "gifted" network assets) or appointed by Icon Water (for "non-gifted" assets) as an independent arbiter of contract directions, issues, claims and variations. In some instances, the Superintendent may also be the Icon Water Representative. Refer to the project specific contract documentation for the entity named as the Superintendent. Note: Where the "Icon Water Representative" has been nominated in this document, the "Superintendent" may be substituted via prior written approval from Icon Water for "gifted" assets. Regardless, the "Superintendent" and/or "Icon Water Representative" must be clearly shown in the Contractor's Inspection and Test Plans.
Supplier or Vendor	A manufacturer, fabricator, distributor, or vendor having a direct contract with the Contractor or with any Subcontractor to furnish materials, equipment, or product to be incorporated in the Work by the Contractor or any Subcontractor.
Witness point	Witness Point means an identified point in a process where the Contractor is required to give Icon Water prior notice with the option to observe an activity based on the contract requirements. Witness points have been identified in Icon Water Standard specifications as a **guide** and shall be established within the boundaries of the contractor scope and context.
Work	The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing or furnishing labour and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.
WorkSafe	Refers directly to the requirements of WorkSafe ACT but shall also imply the requirements of WorkCover NSW (for Icon facilities within NSW) and SafeWork Australia (where appropriate).

Notes:

1. Where the "Icon Water representative" has been nominated in this document, the "Superintendent" may be substituted via prior written approval from Icon Water for "gifted" assets. Regardless, the "Superintendent" and/or "Icon Water Representative" must be clearly shown in the Contractor's Inspection and Test Plans.

2. Wherever used with initial capitalization or entirely in upper case in this specification, the following term have the meaning indicated in this section, which meanings are applicable to both the singular and plural thereof. If a word in these definitions is found to be in lower case, then the lower-case word will have its general meaning.

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1 Introduction

1.1 Background

The accurate planning of buried assets is increasingly required as available urban space becomes more limited due to the growing complexity of urban infill and redevelopment. Thorough planning, design, construction, and accurate recording of water and wastewater pipelines are crucial to prevent clashes during construction and to ensure precise location of data for future maintenance, relocation, or augmentation. This also provides greater certainty to property owners when connecting to Icon Water's water supply and sewerage services.

Inaccurate "as-constructed" records continue to be identified as a significant challenge for water utilities. These inaccuracies are creating challenges, particularly in areas experiencing rapid redevelopment.

Common issues include damage to water and wastewater pipelines during construction, even when utility location services like BYDA are consulted. Designers and Contractors may face increased costs and delays when discrepancies in utility locations are discovered. Safety concerns can arise when utility alignments differ from expected layouts, such as water mains being encroached upon by other infrastructure.

Focusing on tighter construction tolerances and improved records for water and wastewater pipelines and associated pipe protection envelope is essential to address these issues effectively. Addressing these challenges requires following Icon Water standards and maintaining precise and up to date as-built records to enhance accuracy and reduce the risks associated with outdated or incorrect documentation of built infrastructure.

Designers and engineers rely on accurate documentation to plan modifications or expansions. Discrepancies necessitate additional site surveys and design adjustments, extending project timelines and inflating budgets. Furthermore, safety risks are heightened when actual utility alignments differ from documented ones. Unexpected encounters with water mains or other infrastructure can lead to accidents, posing dangers to construction workers and the public.

To ensure consistency with and enhance spatial data accuracy, Icon Water has adopted the Geocentric Datum of Australia 2020 (GDA2020) and the Map Grid of Australia 2020 (MGA2020 zone 55) in 2025, aligning with the ACT Government's transition to these projections. All spatial data and utility records within Icon Water's systems are now required to use GDA2020/MGA2020 zone 55. This aligns Icon Water with national standards, particularly those in New South Wales, and rationalises mapping systems for improved integration and management across the region. MGA2020 zone 55 is now the identified official projection for Icon Water mapping and spatial data. Work as executed drawings (WAE) and submissions for all new projects with contracts must be submitted in the MGA2020 zone 55 projection.

As part of this adoption, Icon Water have been reviewing, and where required, converting existing spatial data to ensure compliance with GDA2020. This transition is consistent with similar efforts by other utilities, developers and organisations in the ACT.

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1.2 Scope

1.2.1 In scope items

This specification shall apply to:

a) The construction, renewal or augmentation of all buried utilities (e.g. water mains, sewer mains and property service connections) intended to be owned and operated or already owned and operated by Icon Water.

b) The construction, renewal or augmentation of all above-ground pipelines, whether they be pressurised or gravity flow, which are intended to be owned and operated by Icon Water.

c) The construction, renewal or augmentation of all surface fittings, maintenance structures and other appurtenances associated with the buried utilities and pipelines detailed in points (a) and (b) above.

d) The determination of the location and attributes of existing buried utilities.

1.2.2 Exclusions

The survey components, including survey tolerancing, do not apply to the following items. However, all information and data must be provided in MGA2020 zone 55.

- The construction of any other Icon Water asset type (e.g. buildings, structures, plant and equipment) not directly forming part of a buried maintenance structure or appurtenance for a buried utility or pipeline.
- The collection and monitoring of survey information required for dam deformation surveys.
- Storm water assets and any other road furniture located within Icon Water leased land unless specifically directed otherwise by Icon Water.
- The location of natural features including vegetation, drainage lines etc., within Icon Water leased land.
- Any other item not specifically detailed in Section 1.2.1 of this specification.

The user is directed to the relevant Icon Water Standards, such as but not limited to referenced items 5 and 13 of Table 1.4.1, for specific guidance and compliance requirements.

1.3 Purpose

The purpose of this specification is to provide requirements for construction and survey accuracies associated with the construction (or location) of buried utilities and above-ground pipelines meeting the scope requirements of Section 1.2.1 of this document.

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1.4 Referenced documents

All works carried out shall be in accordance with the requirements of:

- This specification, including all documents referenced by each section of the specification:
- The documents listed in Table 1.4.1.
- The relevant Icon Water Work Instructions (which will be provided where applicable on a project-by-project basis).
- The relevant WorkSafe ACT, WorkCover NSW and SafeWork Australia codes of practice.

The work shall also comply with the requirements of all relevant legislation, bodies and codes. The order of precedence for this specification, from highest to lowest are:

- Legislative requirements
- Icon Water Specifications
- WSAA standards
- Australian Standards

The Designer or Contractor (as applicable) shall notify the Icon Water Representative of any ambiguity or discrepancy discovered. In the event of an ambiguity or discrepancy, the Icon Water Representative shall direct the Vendor or Contractor as to the interpretation to be followed in carrying out the work.

Where there is no suitable Australian Standard available, an agreed international standard and/or industry current best practice shall be adopted. If an international standard is proposed in lieu of an Australian Standard, the Contractor shall submit to the Icon Water Representative for approval a detailed assessment to show that the proposed standard is equivalent or superior to the relevant Australian standard.

Drawings are not to be scaled. Where any discrepancy exists between figured and scaled dimensions the figured dimensions shall prevail.

The documents listed in Table 1.4.1 - Referenced documents are either referenced by within this specification or shall be read in-conjunction with this specification and be complied with.

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Table 1.4.1 - Referenced documents

Item	Document Number	Title
Australian Standards		
1	AS 5488	Classification of Subsurface Utility Information (SUI)
WSAA Codes and Publications		
2	WSA 02	Gravity Sewerage Code of Australia
3	WSA 03	Water Supply Code of Australia
4	WSA 04	Sewage Pumping Station Code of Australia
Icon Water Standards		
5	STD-SPE-C-001	Technical Specification, Civil & Structural Works
6	STD-SPE-C-005	Technical Specification, Pipelines
7	STD-SPE-G-008	Technical Specification, Design Requirements for Safe Access, Egress and Working at Heights
8	STD-SPE-G-010	Supplement to WSA 04 Sewage Pumping Station Code of Australia
9	STD-SPE-G-011	Supplement to WSA 02 Gravity Sewerage Code of Australia
10	STD-SPE-G-012	Supplement to WSA 03 Water Supply Code of Australia
11	STD-SPE-G-018	General Specification, Drafting Standards
12	STD-SPE-G-019	Developer Provided Assets, Water Supply and Sewerage, Asset Creation and Approval Process
13	STD-SPE-M-001	Technical Specification, Mechanical Works
14	Various	SD Series Drawings

Note: The documents shall be the latest publication at the time of award of contract for execution of the works unless noted otherwise in the project specific documentation.

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2 General requirements

2.1 Datum and Map Grid

Icon Water's datum and map grid requirements are detailed in Sections 2.1.1 and 2.1.2.

2.1.1 Vertical datum

Australian Height Datum (AHD)

Levels (expressed as RL) shall reference Australian Height Datum (AHD). This requirement also includes all works at LMWQCC.

The use of the term "ML" is defunct, and "ML" shall not be shown on any drawing or survey record.

2.1.2 Map grid

Map Grid of Australia Zone 55 on Geocentric Datum of Australia 2020 (MGA55 z55 GDA2020)

The Map Grid of Australia (MGA), Zone 55 (a transverse Mercator projection that conforms to the international Universal Transverse Mercator (UTM) Grid system) on the GDA2020 datum shall be referenced for all works located within the borders of the ACT (and those areas currently proposed to be incorporated with the ACT), the Queanbeyan urban areas and their immediate surrounds (Including the Jerrabomberra and Googong urban areas).

For works which straddle both the ACT and NSW, or for works which are fully located within NSW outside of the Queanbeyan urban area, Icon Water will accept information collected in the projection specified above for all Icon Water, water abstraction catchments including northern parts of the Lower Cotter catchment, the Googong catchment and Upper Murrumbidgee to Angle Crossing and Upper Murrumbidgee to Cotter Pumphouse catchment areas. Additionally, any areas within the Yass Valley Local Government area immediately to the north of the ACT will also be accepted in this projection.

For works in areas not specified above, the designer shall contact Icon Water as early as possible in the design phase to determine the requirements if not already shown in the project specific documentation.

Although it is not Icon Water's preference to receive any survey information on a local grid, it is acknowledged that a local grid may be required in some circumstances. The designer shall contact Icon Water as early as possible in the design phase to determine such requirements if not already shown in the project specific documentation.

Commentary: *Prior to 2025, Icon water required that all information be provided on the ACT Grid (a customised Mercator projection with a central meridian that passes through Mt Stromlo observatory) on the Australian Geodetic Datum of 1966. The change to the current Map Grid of Australia specification allows for consistency with Icon water, ACT Government organisations, surrounding NSW, and relevant stakeholders.*

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2.2 Design tolerances

Icon Water's buried utilities and aboveground pipelines shall be designed in accordance with the design tolerances specified in referenced items 2, 3, 4, 6, 8, 9 and 10 of Table 1.4.1 as applicable.

2.3 Surveyor requirements

A Qualified Surveyor is required for the following works:

a) Determination of the location and attributes of existing buried utilities when Quality Level A to AS 5488 (or a more stringent tolerance such as A^{+} or A^{++} as described in this specification) is required.

b) Construction set-out for all works within the scope of this specification.

c) Validation and checking of locations/positions in both the vertical and horizontal planes (i.e. X, Y and Z) for all works within the scope of this specification.

d) Recording of WAE locations/positions in both the vertical and horizontal planes (i.e. X, Y and Z) for all works within the scope of this specification.

A Qualified Surveyor is a person who has both the education/qualifications and practical experience that meet at least one of the criteria types detailed in Table 2.3.1.

Table 2.3.1 - Qualifications and Practical Experience Requirements of a Qualified Surveyor

Criteria Type	Education/Qualification	Practical Experience
1A	2 years of tertiary level study in the field of "Surveying" from a recognised tertiary institution with attainment of a formal qualification.	At least 24 months of approved practical experience in surveying.
1B	A "Diploma of Surveying" from a recognised tertiary institution.	
2A	3 years of tertiary level study in the field of "Surveying" from a recognised tertiary institution with attainment of a formal qualification.	At least 18 months of approved practical experience in surveying.
2B	An "Advanced Diploma of Surveying" from a recognised tertiary institution.	
3A	4 years of tertiary level study in the field of "Surveying" from a recognised tertiary institution with attainment of a formal qualification.	At least 12 months of approved practical experience in surveying.
3B	A "Bachelor's Degree of Surveying" from a recognised tertiary institution with a minimum duration of 4 years full-time study.	
4A	A Registered Land Surveyor	As per the requirements of ongoing registration.
4B	A Registered Mining Surveyor	

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Hold Point 1 – Submission of surveyor's qualifications prior to commencement of any works.

Icon Water will require the detailed Curriculum Vitae (CV) of all Qualified Surveyors engaged for the works detailed in Section 2.3 of this specification (points (a) through (d) inclusive). That is, the CV of the Qualified Surveyor need only be submitted once for review and acceptance as Icon Water will keep the submitted details on file for future works.

Icon Water reserves the right to reject the use of a proposed surveyor if Icon Water does not believe that the proposed Surveyor meets the Qualified Surveyor requirements detailed in Table 2.3.1. In the event of any dispute with Icon Water regarding surveyor suitability, Icon Water will defer to the ACT Government's Office of the Surveyor-General & Land Information to adjudicate on the qualifications and practical experience of the proposed surveyor and to provide a formal ruling as to whether the proposed surveyor meets the Qualified Surveyor requirements.

Given Icon Water is reliant upon a third party to provide a formal ruling in the event of any potential dispute, Icon Water does not take any responsibility for any time delays associated with obtaining such a ruling and will not accept any liability for any loss or damages arising. It is therefore advisable that Developers, designers or Contractors (as applicable) propose a surveyor for review/acceptance by Icon Water as early as possible in the design process or well in advance of construction commencement (as applicable).

Qualified Surveyors shall comply with all relevant ACT legislation as well as the relevant Survey Practice Directions and Guidelines as issued and updated from time-to-time by the ACT Government's Office of the Surveyor-General & Land Information. The ACT Registrar of Surveyors at surveyors.registrar@act.gov.au can be contacted for registered surveyors list in the ACT.

The Qualified Surveyor shall provide the raw data file from the survey equipment used if requested by Icon Water. For example for "Trimble" branded equipment, the ".ssf" shall be provided.

When a Qualified Surveyor is used for the location of existing buried services, the Qualified Surveyor shall comply with the work plan and SWMS requirements detailed in Section 2.4 of this specification. This shall occur regardless of the Quality Level required.

Commentary: *The requirements outlined in Table 2.3.1 was proposed by the Deputy Surveyor-General of the ACT. Ultimately, qualification requirements will be determined and administered by the ACT Government's Office of the Surveyor-General and Land Information. A list of Qualified Surveyors approved for works within the ACT is available from the Office of the Surveyor-General and Land Information website. This list can be accessed through Access Canberra, which provides details of registered land surveyors or by contacting the ACT Registrar of Surveyors at surveyors.registrar@act.gov.au.*

2.4 Requirements for the location of existing buried services

Hold Point 2 - Submission of a detailed work plan and SWMS prior to commencing works.

A Qualified Surveyor (as per the requirements of Section 2.3) shall be used for the determination of the location and attributes of existing buried services when Quality Level A (or a more stringent tolerance such as A^{+} or A^{++}) is required. There is no requirement to engage a Qualified Surveyor for the determination of the location and attributes of existing buried utilities when a Quality Level lower than Quality Level A is required (i.e. Quality Levels B through D inclusive). That is, a reputable

"buried services locator" may be used in lieu of a Qualified Surveyor. However, the service provider must show evidence of:

- Suitably experienced and qualified personnel
- Suitable locating equipment with in-date calibration records

Furthermore, a detailed work plan and SWMS shall be submitted for review and acceptance by Icon Water prior to commencing works. It should be noted that Icon Water does not allow the covers/hatches of structures such as maintenance holes to be opened/lifted by anyone other than suitably trained and equipped Icon Water employees. This is for reasons of both safety (e.g. dangerous sewer gases) as well as network security. Therefore, the requirement to have Icon Water in attendance should be determined well in advance of any site works that require access to maintenance holes and other maintenance structures.

The service provider shall provide the raw data file from the equipment used upon request from Icon Water. For example for "Trimble" branded equipment, the ".ssf" shall be provided.

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3 Survey requirements

3.1 Icon Water amendment to AS 5488.1

Icon Water has adopted AS 5488.1 as a basis for specifying survey tolerances and attribute information for the construction of new utilities and pipelines as well as for the location of existing buried services. However, Icon Water has some amendments to AS 5488.1. Designers, Contractors, surveyors and other parties such as buried services locators shall interpret AS 5488.1 in-conjunction with the amendments detailed in Table 3.1.1. The amendments detailed in Table 3.1.1 takes precedence over the requirements of AS 5488.1.

Table 3.1.1 - Icon Water amendments to AS 5488.1

AS5488.1 Page Ref.	Amendment and/or addition
Page 1	**SECTION 1 SCOPE AND GENERAL** **1.1 SCOPE** Delete the 2nd paragraph and insert the following content in its place: This Standard applies to: a) Subsurface utilities and associated surface features owned and operated or intended to be owned and operated by Icon Water. These features may include but not be limited to access chambers, stop valves, surface fittings and other surface related facilities. b) Aboveground water and sewer mains and other aboveground pipelines owned and operated or intended to be owned and operated by Icon Water. This includes features such as but not limited to stop valves, scour valves, air valves and maintenance structures. Add a final paragraph directly after the existing 4th paragraph as follows: Where the term “subsurface” is encountered in this Standard, the word “aboveground” may also be substituted as applicable to avoid having to repeat the same requirements for both buried and aboveground utility and pipeline applications as the requirements for both are identical unless noted otherwise.
Page 8	**SECTION 2 QUALITY LEVELS** Modify the title of Clause 2.7 and replace the content in Clauses 2.7.1 through 2.7.2 inclusive in their entirety as follows: **2.7 QUALITY LEVELS A, A+ and A++** **2.7.1 General** Quality Levels A, A+ and A++ are the highest quality levels and consist of the positive identification of the attribute and location of a subsurface utility at a point to an absolute spatial position in three dimensions. Quality Levels A, A+ and A++ are the only Quality Levels that define a subsurface utility as “validated”. Quality Levels A, A+ and A++ have identical maximum horizontal tolerances but increase in order of “tighter” maximum vertical tolerances with Quality Level A++ being the most stringent. Refer to Table IW. 2.7.2.1 for details.

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Achieving Quality Level A: The whole line segment shall be deemed to satisfy Quality Level A when the maximum distance between survey location points is no greater than 25 metres for gravity sewer mains, other gravity flow pipelines and any pressure or gravity main/pipeline constructed of polyethylene pipe; and 50 metres for water mains and other pressurised pipelines which are not constructed of polyethylene pipe. Furthermore, survey location points shall be validated at every (i) entrance and exit at each maintenance structure, including windowsill levels on MHs with external drops (ii) valve and hydrant (iii) junction (iv) change of direction, and (v) surface fitting. Cover levels also require validation at the same maximum distances (i.e. 25 metres or 50 metres) as stated above.

Achieving Quality Levels A^{+} and A^{++}: The service must be exposed (i.e. backfill removed or backfill not yet installed) for the line segment to be attributed Quality Level A^{+} or A^{++}. Furthermore, survey location points shall be validated along the line segment at no greater than 5.0 metre intervals and at every (i) entrance and exit at each maintenance structure, including windowsill levels on MHs with external drops (ii) valve and hydrant (iii) junction (iv) change of direction, and (v) surface fitting. Cover levels also require validation at the same maximum interval (i.e. 5.0 metres) as stated above.

2.7.2 Attribute information

Refer to *STD-SPE-G-018 Drafting Standard* for the attribute information required for Icon Water WAE records. Otherwise, Quality Levels A, A^{+} and A^{++} attribute information shall include:

a. The utility owner (if not Icon Water)

b. The utility:

   i. Type

   ii. Status

   iii. Material (e.g. DICL, PE100, SCL, PVC-U, PVC-M, PVC-O, GRP for Icon Water pipes)

   iv. Size (DN) and pressure (PN) rating for pressure pipes or size (DN) and stiffness rating (SN) for non-pressure pipes; otherwise, basic size details for non-Icon Water utilities

   v. Configuration

c. The date of installation (if known)

d. Feature codes of surface and subsurface features including but not limited to pits, access chambers, valves and hydrants etc. as per the Icon Water *SD Series* of drawings.

e. The location of points surveyed and subsurface features measured in terms of absolute spatial positioning with a maximum horizontal and vertical tolerance in accordance with Table IW.2.7.2.1.

Table row continues next page

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AS5488.1 Page Ref.	Amendment and/or addition

Witness Point 1 – Confirmation works comply with tolerances shown in Table IW.2.7.2.1 and Section 2.7.3.

Table IW.2.7.2.1 - Maximum Horizontal and Vertical Tolerances for Quality Levels A, A⁺ and A⁺⁺

Quality Level	Max. Horizontal Tolerance (mm)	Max. Vertical Tolerance (mm)
A	± 50	± 50
A⁺		± 20
A⁺⁺		± 10

2.7.3 Metadata

Quality Level A, A⁺ and A⁺⁺ metadata shall include:

a. The Quality Level acronym conveyed as QL-A, QL-A+ or QL-A++
b. The date that the data was captured
c. The source of the information
d. The survey and locating methods used to obtain the attribute information
e. Survey control information used to determine the absolute spatial position of the utility

Page 16

APPENDIX B

TABLE B2

PRIMARY CODE AND LINE COLOUR

Delete Table B2 and insert the following text:

Refer to the Icon Water *SD Series* of drawings for the Primary Code and Line Colour details to be used for Icon Water projects.

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3.2 Integrated construction and survey technology

Hold Point 3 – Confirmation of survey capture of the new service prior to backfill.

When constructing new services, it is a mandatory requirement that surveying occurs concurrently with the construction of new line segments and associated structures and appurtenances unless such infrastructure can be left exposed (e.g. not backfilled above the top of the pipe, encased or otherwise made inaccessible) without any quality, practicability or safety issue arising.

In the event that the newly constructed infrastructure is no longer exposed (e.g. backfilling has been completed) and a Qualified Surveyor has not yet validated the construction to the required Quality Level detailed in this specification, Icon Water has the right to reject the works and seek remedies in accordance with (i) the executed *Hydraulic Services Deed* with the Developer – in the case of Developer provided assets, or (ii) the executed contract between Icon Water and the Contractor – in the case of projects delivered by Icon Water's Project Delivery Teams as part of the IPaD process. Note: Such remedies may include demolition and excavation activities at the cost of the Developer or Contractor as appropriate.

3.3 Quality level requirements

Table 3.3.1 summarises the AS 5488 Quality Levels (as amended by this specification in Table 3.1.1) and the methods that may be used to validate these levels as well as the survey tolerances required.

Table 3.3.1 - Quality Levels, Maximum Tolerances and Methods of Validation

Quality Level	Validation Method and/or Survey Requirements	Max. Horizontal Tolerance (mm)	Max. Vertical Tolerance (mm)
D	Existing records, site inspection or anecdotal evidence.	N/A	N/A
C	As for Quality Level D. However, a survey of surface features is also required to determine relative spatial positioning. The survey need not be undertaken by a Qualified Surveyor (e.g. a reputable services location contractor may be used).	± 300	N/A
B	As for Quality Level C. However, a survey is required of both the surface features and buried features to determine relative spatial positioning. The survey need not be undertaken by a Qualified Surveyor (e.g. a reputable services location contractor may be used).	± 300	± 500
A	As detailed in Table 3.1.1 of this specification. The work shall be performed by a Qualified Surveyor.	± 50	± 50
A+			± 20
A++			± 10

DRAFT

The Quality Level required for survey-related information varies according to the project stage and the type of infrastructure. Icon Water requires a higher Quality Level (i.e. a "tighter" tolerance) as the project progresses through planning, design and construction. Table 3.3.2 details Icon Water's minimum Quality Level requirements by project stage and infrastructure type.

Table 3.3.2 - Minimum quality level requirements by project stage and infrastructure type

Infrastructure Type	Project Stage or Survey Purpose	Minimum Quality Level Required
Existing buried infrastructure	Design Submission 1 (Note 1)	D
	Design Submission 2 (Note 2)	C or A (Note 3)
	WAE Records	A or A^{+} or A^{++} and C (Note 4)
Existing surface features	Design Submission 1 (Note 1)	C
	Design Submission 2 (Note 2)	B
	WAE Records	A
Proposed/ Designed As-Constructed water and sewerage infrastructure	Design Submission 1 (Note 1)	Note 5
	Design Submission 2 (Note 2)	Note 5
	WAE Records – water mains, water supply property service connections and other pressure pipelines as well as associated structures and appurtenances (e.g. valves, valve chambers and surface fittings etc.)	A
	WAE Records – gravity sewer mains and other gravity flow pipelines excluding sewer ties, associated structures and appurtenances: Grade ≤ 1.0 % Grade > 1.0 %	 A^{++} A^{+}
	WAE Records – Property service ties for sewer, structures and appurtenances associated with sewer mains and other gravity flow pipelines (e.g. MHs, valves and surface fittings)	A
	WAE Records – interconnecting (buried) pipework forming part of a sewage pumping station or water pumping station (unless project specific documentation states otherwise)	A^{++}

Notes:

1. "Design Submission 1" refers to the asset creation and acceptance process for Developer provided assets as per STD-SPE-G-019. For the purposes of complying with this specification, Icon Water Project Delivery Teams and external services providers shall interpret this stage as being equivalent to the completed/accepted "Concept Design" for projects executed by Icon Water Project Delivery Teams as part of the IPaD process.
2. "Design Submission 2" refers to the asset creation and acceptance process for Developer provided assets as per STD-SPE-G-019. For the purposes of complying with this specification, Icon Water Project Delivery Teams and

DRAFT

external services providers shall interpret this stage as being equivalent to the completed/accepted “Detailed Design” for projects executed by Icon Water Project Delivery Teams as part of the IPaD process.

3. When the existing buried infrastructure requires connection to the proposed/new infrastructure, or when the existing buried infrastructure requires validation (e.g. to ensure that the proposed design can be built ensuring clash avoidance or maintaining minimum separation distances with existing utilities) then Quality Level A is required. Otherwise, Quality Level A at the point of exposure (e.g. maintenance hole) and Level C along the asset is the minimum Quality Level requirement.
4. When additional/updated attribute and location information is gathered during construction for existing buried infrastructure, this shall be included in the WAE records (e.g. drawings) at the more stringent Quality Level (i.e. Quality Level A, A^{+} or A^{++})at a point/location of access (maintenance hole, service tie, etc.) with Quality Level C as the minimum Quality Level required between survey points/locations.
5. Use the design tolerances specified in the relevant Icon Water Standard when proposing or designing new water and sewerage infrastructure. Refer to Section 2.2 and Table 1.4.1 for details.

DRAFT

4 Tolerances on Work as Executed (WAE)

4.1 General

All water mains, gravity sewer mains, property service connections, gravity and pressurised pipelines etc. and associated structures and appurtenances shall be constructed in the positions shown on the project specific construction drawings in accordance with the construction tolerances specified in Table 4.1.1, Table 4.1.2, Table 4.1.3 and Table 4.1.4 ensuring that (i) the minimum depth of cover, and (ii) the minimum clearances to other services are complied with. For gravity flow pipelines such as but not limited to sewer mains, reverse grades (i.e. backfalls) are prohibited. Refer to the relevant WSAA code, Icon Water supplement to the relevant WSAA code or the Icon Water pipeline specification (i.e. reference items 2, 3, 4, 6, 8, 9 and 10 in Table 1.4.1 - Referenced documents of this specification) as applicable.

During construction, if it is found that (i) the minimum clearances to other services, or (ii) the minimum depth of cover, or (iii) positive grades cannot be maintained by complying with the project specific construction drawings, Icon Water Representative (for Developer provided assets) shall propose an alternative alignment/location or alternative remedy for review and acceptance by Icon Water. Alternative remedies may include (i) the re-alignment/relocation of the existing services, or (ii) the use of protection slabs, pipe sleeves or encasement. For projects executed by the Icon Water Project Delivery Teams as part of the IPaD process, the Contractor shall contact the Icon Water Representative. Construction shall not proceed without written Icon Water approval of either the new alignment/location or alternative remedy.

Table 4.1.1 - General construction tolerances by infrastructure type

Infrastructure Type	Construction Tolerance (Note 2)	
Pressurised pipelines (Notes 1 and 4)		
Witness Point 2 – Confirmation of pressurised pipelines construction tolerances prior to backfill.		
Pressurised pipelines such as but not limited to: a) water mains, b) water supply property services (i.e. mains-to-meter) pipe runs, c) sewer rising mains, and d) all other pressurised pipelines	Horizontal Location:	± 75 mm (applied to pipe CL)
	Vertical Location:	± 50 mm (applied to pipe IL) subject to achievement of a continuously rising grade between the design position of high and low points proceeding in the direction of the high point.

DRAFT

Infrastructure Type	Construction Tolerance (Note 2)	
Gravity flow pipelines (Notes 1 and 4)		
Hold Point 4 – Confirmation of Gravity flow pipelines construction tolerances prior to backfill.		
Gravity flow pipelines such as but not limited to: a) gravity sewer mains, b) sewerage property services (i.e. mains-to-tie) pipe runs, and c) all other gravity flow pipelines	Horizontal Location:	± 75 mm (applied to pipe CL)
	Vertical Location:	10 mm higher and 25 mm lower (applied to pipe IL) on the proviso that the grades specified in Table 4.1.2 are complied with and no localised low points exist.
Structures, surface fittings, risers and associated appurtenances etc.		
Junctions/branches of gravity or pressurised mains and pipelines.	Horizontal Location:	± 75 mm
Maintenance holes, Sewer Maintenance Shafts and Rodding Points. Enclosures, cabinets, boxes, pits and chambers containing water supply related items such as but not limited to: water meters, RPZDs, valves and pumps. Surface structures and fittings such as but not limited to: surface boxes, hydrants, hydrant risers, shrouds and valves.	Vertical Location of Surface Element(s): (Note 5)	For the top surface of a buried structure or hatch/cover of a buried structure or surface fitting or surface box designed to finish at or above the finished surface level, apply a tolerance at any point on the top surface as follows: 0 to + 20.0 mm in garden beds, grassed areas and other unsealed areas where only occasional pedestrian or vehicular traffic is likely; otherwise: ± 5.0 mm for all other applications and locations.
	Other Tolerances: (e.g. formwork, plumb, wall thickness and other geometric dimensions etc.)	As per the tolerances detailed in Icon Water specification: *STD-SPE-C-001* (*Civil and Structural Works*)

Notes:

1. The horizontal and vertical location tolerances shown for “pressure pipelines” and “gravity flow pipelines” are not applicable to the interconnecting (buried) pipework forming part of a sewage pumping station or water pumping station. For such applications, compliance with Table 4.1.3 is required.
2. The horizontal tolerances stated are for the lateral position across, as well as axial position along the main or pipeline (i.e. X and Y).

DRAFT

3. It is acceptable to determine the as-constructed vertical location of the pipe CL or IL by accurately surveying the position of the pipe crown and then performing a calculation based on the known pipe thickness (including internal lining if applicable) and diameter (outside or inside as applicable).
4. Angularity construction tolerances for property service connections and other branch lines shall be in compliance with Table 4.1.4.
5. Regardless of the vertical tolerance applied to the top surface of covers, hatches and the top surface of buried structures etc., the trip hazard requirements specified in Icon Water specification STD-SPE-G-008 Design Requirements for Safe Access, Egress and Working at Heights take precedence over the tolerances provided herein. That is, if a "flush fit" condition is required as per STD-SPE-G-008 then the design element must have a top surface located flush with, or no higher than 5.0 mm above the surrounding finished surface(s).
6. Minimum depth of cover and minimum clearances from other services shall also be achieved within the construction tolerances provided in Table 4.1.1.

Hold Point 5 – Confirmation of construction tolerances as per Table 4.1.2 prior to backfill.

Table 4.1.2 - Construction tolerances on grade – gravity flow pipelines

Design Grade	Minimum Acceptable Construction Tolerance on Grade
≤ 1.0 %	0% flatter, 10% steeper
> 1.0 %	0% flatter, 15% steeper

Notes:

1. Localised low points (not specifically included as part of the accepted design) are prohibited.
2. Minimum depth of cover and minimum clearances from other services shall also be achieved within the construction tolerances provided in Table 4.1.2.

Hold Point 6 – Confirmation of construction tolerances as per Table 4.1.3 prior to backfill.

Table 4.1.3 - Construction tolerances – interconnecting (buried) pipework for pump stations

Infrastructure Type	Construction Tolerances	
Pump station interconnecting (buried) pipework	Horizontal Location:	± 15 mm (applied to pipe CL)
	Vertical Location:	± 15 mm (applied to pipe IL)
	Angularity:	± 1.0° angularity on branches
	Grade:	As per Table 4.1.2.

Notes:

1. The construction tolerances to be applied for all other elements of sewage and water pumping stations shall be as per Table 4.1.1.
2. Localised low points (not specifically included as part of the accepted design) are prohibited.
3. Minimum depth of cover and minimum clearances from other services shall also be achieved within the construction tolerances provided in Table 4.1.2.

DRAFT

Witness Point 3 – Confirmation of construction tolerances as per Table 4.1.4 prior to backfill.

Table 4.1.4 - Construction tolerances – angularity - branches and service connections

Infrastructure Type	Angularity Tolerance
Pipe/pipeline branches	± 2.0° subject to the horizontal and vertical location tolerances specified in Table 4.1.1 being achieved.
Property service connection branches (excluding pump station interconnecting pipework)	

DRAFT

5 Requirements for the production of WAE drawings

The requirements for the production of WAE drawings are detailed in Icon Water specification *STD-SPE-G-018 Drafting Standard*. It should be noted that the engagement of both a Qualified Surveyor and an ACT Registered Civil Engineer is a requirement for all new works meeting the scope requirements detailed in Section 1.2.1 of this specification.

DRAFT

6 Witness and hold points

6.1 General

Witness and Hold Points have been nominated at various points in this specification as a guide and are denoted by the following example:

Hold Point 1 – Submission of surveyor's qualifications prior to commencement of any works.

The definition of the hold or witness point is designated in the title. The detailed requirements of the particular hold or witness point are then elaborated in the proceeding sentence, paragraph or section below the hold or witness point. It is the Contractors responsibility to identify all hold and witness points and make themselves familiar with the specific requirements required to fulfil the hold and witness points.

Without limiting the Conditions of Contract, Icon Water does not assume or owe any duty of care to the Contractor to review, or in reviewing the submissions by the Contractor, for errors, omissions or compliance with a Contract.

Endorsement by Icon Water at a Hold or Witness point does not release the Contractor from its obligations to achieve the specified requirements of a Contract.

Hold point

- A milestone when acceptance is required from Icon Water, prior to commencing the subsequent construction activity. Acceptance from Icon Water must be obtained by providing all necessary documentation as required by the Icon Water specification.
- Hold Points shall apply prior to commencement of designated work lots or work items. Hold points have been identified in Icon Water Standard specifications and shall be established within the boundaries of the Contractors scope and context.

Witness point

Witness Point means an identified point in a process where the Contractor is required to give Icon Water prior notice with the option to observe an activity.

- Witness Point means an identified point in a process where the Contractor is required to give Icon Water prior notice with the option to observe an activity based on the contract requirements.
- Provide a minimum of 48 hours' notice (Monday to Friday) to Icon Water of a witness point being reached. Work may proceed if Icon Water Representative has not viewed the work within the specified period.
- If Icon Water Representative does not attend a Witness point, the Contractor is to provide photographic record of the activity as part of Contractor's close out and signoff record

The table below presents minimum requirements for the witness and hold points to be detailed in the Contractor's inspection and test plans. These witness and hold points may be modified by Icon Water after review of the Contractor's Program and the Contractor's Management Plans.

The hold points in this specification can be adopted based on the specific needs of each project. In the absence of an approved ITP, these hold points shall be considered as default. The Icon Water

DRAFT

Representative should be informed, and they may then decide whether or not to carry out an inspection.

Table 6.1.1 - Witness and hold points

Description	Section	Page #
Hold Points		
Hold Point 1 – Submission of surveyor's qualifications prior to commencement of any works.	2.3	7
Hold Point 2 - Submission of a detailed work plan and SWMS prior to commencing works.	2.4	7
Hold Point 3 – Confirmation of survey capture of the new service prior to backfill.	3.1	12
Hold Point 4 – Confirmation of Gravity flow pipelines construction tolerances prior to backfill.	4.1	16
Hold Point 5 – Confirmation of construction tolerances as per Table 4.1.2 prior to backfill.	4.1	17
Hold Point 6 – Confirmation of construction tolerances as per Table 4.1.3 prior to backfill.	4.1	17
Witness Points		
Witness Point 1 – Confirmation works comply with tolerances shown in Table IW.2.7.2.1 and Section 2.7.3.	3.1	11
Witness Point 2 – Confirmation of pressurised pipelines construction tolerances prior to backfill.	4.1	15
Witness Point 3 – Confirmation of construction tolerances as per Table 4.1.4 prior to backfill.	4.1	18

DRAFT

Appendices

Appendix A – Technical specification update history

A.1 Update history

Issue 1 (02/07/18) Issued for mandatory use.

A.2 Issue 2 updates

Section	Update	Comment
Abbreviations and Definitions	Additions	Additional Abbreviations and Definitions added to both tables.
Throughout	ACT Registered Engineer	Amendments made to comply with the ACT Engineers Registration Scheme including swapping references from Charted Engineer to ACT Registered Engineer.
Throughout	Hold and Witness Points	Addition of Hold Points and Witness points throughout the document.
Clause 1	Update	Introduction updated to reflect changes since last edit in 2018.
Clause 5.1.2	Map Grid	Map Grid updated to specify MGA2020 as the official projection for Icon Water mapping and spatial data.
Clause 6 and Various	Hold and Witness Points	Addition of Hold and Witness points throughout document including addition of new section defining Hold and Witness points.
Appendix A	Technical Specification Update History	Inclusion of Appendix A, Technical Specification Update History.
Various	Minor Amendments	Various amendments throughout document captured in MS Word Tracked Changes.
Entire Document	Format	Update the document to incorporate the new template and branding.

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